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ABSTRACT

This report discusses briefly the concept of open education and its application at the college and university level. Efforts already underway in the United States and abroad are covered in two appendices. Four models of open universities are described in some detail. One model is based on the extension of community college activities. The second model assumes a close relationship with one or more four-year institutions. The third model is based on a nationwide network of relatively independent neighborhood learning centers, and the fourth model is an elaboration of existing efforts to provide postgraduate professional education by television lessons. Each model is broken into four component systems: a learner access system, a distribution system, a production-procurement-storage system, and a credentialling system. In addition to model descriptions, seven recommendations are proposed as steps that can expedite the growth of open universities in the United States. (Author)

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OPEN UNIVERSITIES IN THE UNITED STATES

FOUR MODELS AND RECOMMENDATIONS

David Miller

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October 1972

Part 1

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FINAL REPORT

HEW-OS-72-206

OCTOBER 1972

OPEN UNIVERSITIES IN THE UNITED STATES

FOUR MODELS AND RECOMMENDATIONS

DAVID MILLER

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A REPORT PREPARED BY

THE OFFICE OF TELECOMMUNICATIONS

DEPARTMENT OF HEALTH, EDUCATION & WELFARE

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ABSTRACT

This report discusses briefly the concept of open education and its application at the college and university level. Efforts already underway in the United States and abroad are covered in two appendices. Four models of open universities are described in some detail. One model is based on the extension of community college activities. The second model assumes a close relationship with one or more four-year institutions. The third model is based on a nationwide network of relatively independent neighborhood learning centers, and the fourth model is an elaboration of existing efforts to provide postgraduate professional education by television lessons. Each model is broken into four component systems; namely,

A LEARNER ACCESS SYSTEM

A DISTRIBUTION SYSTEM

A PRODUCTION-PROCUREMENT-STORAGE SYSTEM

A CREDENTIALLING SYSTEM

In addition to the model descriptions, seven recommendations are proposed as steps that can expedite the growth of open universities in the United States.

SUMMARY OF RECOMMENDATIONS

1. The N.I.E. provide matching funds for a market survey to any state agency proposing to set up an open university.
2. A Federal Council of State Open Education Boards be established.
   An Open Education Division be established in the Bureau of Higher Education, U.S. Office of Education.
3. Legislation be sponsored to create a loan program at the $200 million level to provide capital funds to initiate and maintain learning center operations.
   The Open Education Division would administer this loan program.
4. An O.E./H.E.W. program be initiated to encourage the production of high quality instructional materials.
5. An O.E./H.E.W. program at the $40 million level be established to foster the development of networks linking learning centers to each other and to regional and state production centers.
   The need for a national network should be explored.
6. The N.I.E. give the concept of Regional Examining Universities high priority as a study area.
7. The O.E. initiate a hardware development program at the $3 million level, to encourage the design of equipment, specifically for educational applications.

I. INTRODUCTION

A college degree has long been an essential qualification for advancement and success in the opportunities our society offers. As a result, young people have sought admission to colleges in ever-increasing numbers. In recent years, this trend has led to proposals that higher education be made available to all young people completing high school. The admission practices of many community colleges are based on this policy, and, among the four-year colleges, the City College of New York has had open admission for the past two years.

Only twenty years ago, less than one-fourth of all high school graduates entered college. Today, nearly fifty per cent of the high school population begins college, with one-third attaining a four-year degree. As access to a college education has eased for young people, an increasing number of adults are seeking a second chance to partake of the benefits of post-secondary-education. Included in this new student population are people whose earnings and promotions are educationally limited, the unemployed needing new job skills, women who look to careers after raising families, and the growing ranks of retired people seeking cultural enrichment. It is estimated that the potential second-chance population may be as many as 82 million by 1975.

Another potential addition to the college population is the growing number of people who will need re-certification as the

result of state and federal legislation. California has recently ordered all pharmaceutical licenses be renewed. NASA is anticipating the need to periodically re-certify all aircraft pilots and all air-traffic controllers. Re-certification programs for dentists, medical personnel, teachers, engineers and other professionals are under consideration nationwide.

It is apparent then, that as enrollment in higher education continues to grow, an increasing fraction of the students will be adults -- adults with diverse backgrounds, educational needs, and academic proficiencies. Their increasing numbers will intensify the critical fiscal problems most colleges already face. Their diversity of educational needs will expose the limitations of the traditional college curricula to meet those needs, and their wide range of academic proficiencies will create serious administrative and procedural complications. Administrators, trying to solve these problems, must also cope with the high resistance to change which is so characteristic of academic organizations. Viewed realistically, the prospect is that, over the short term, most established four-year colleges and universities may be unwilling or unable to accommodate all of these new students, and that an alternative educational organization will be needed to provide this new type of student body with a satisfactory educational experience.

One such organization is the open university. The initial

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... university have been started or are
...ing this formative period, various
...rnment are being asked to assistant
the groups that are sponsoring these new schools. Since these schools offer a possible solution to the aforementioned problems of higher education, an appropriate role for Federal Government needs definition. The purpose of this report, therefore, is to explore the open university as an alternative to traditional colleges and to suggest a framework for federal initiatives.

II. FEDERAL PROGRAM

The Federal Government can and is participating in the development of U.S. open universities in a variety of ways. A useful plan for viewing these activities is by creating models for several types of open universities, and then analyzing the capabilities and the costs of these educational systems.

Program Objectives

The primary goal of these programs is to foster the development of a form of post-secondary education which can serve as an alternate or supplement to the conventional programs of educational institutions; to do so at a lower cost; and to so structure the process that it becomes an attractive, well-used, and effective educational resource. A secondary objective is to encourage conventional institutions to use the materials and procedures that result from these developments to increase the quality and variety of their educational programs, and to do so without undesirable cost increases.

Data Base

A large body of data is required for successful formulation of appropriate models. First, the distinguishing features of an open university must be determined. While open universities in the United States vary widely in organization and practice, they all have certain common characteristics. Entrance requirements are liberalized, residential requirements are removed, and special

degree and credit-granting systems are established. In most cases, the new schools are closely associated with one or more universities, but usually they maintain a separate administrative organization. To provide time and geographic flexibility, instructional practices are similar to those of many university-extension divisions. In fact, some schools (such as the proposed Open School at the University of Wisconsin) are the direct outgrowth of extension programs, The motivational and instructional limitations of conventional correspondence courses are overcome by employing more sophisticated educational technology, often involving the services of a university learning resources center. Provision for individual counseling and tutoring sessions offer the student a personal program of instruction.

Details concerning individual American open-university programs are contained in Appendix B. Related developments in countries other than Great Britain are listed in Appendix C.

A second vital body of information required to construct a model is the number, sources, and types of students who might attend an open university. Equally important is the determination of programs of study which will ensure the participation and financial support of these students. Available data on potential students and suitable programs is totally inadequate. Certain assumptions regarding these areas have been made in this report to allow the development of other aspects of the models, but the need

for more and better information on these two questions is imperative.

Suitable data for determining cost estimates for various elements of the models is another type of essential information difficult to obtain. Cost data is voluminous and dependent upon many parameters. When simplifying assumptions are made, the resulting data is always subject to being used out of context, leading to erroneous conclusions or charges of inaccuracy. However, systems costs and their comparison is a necessary guide to decision-making, and such data has been included whenever it could be obtained.

Fortunately, there is a wealth of information available on telecommunications and educational technology. Those sources which were used most extensively in this report are listed in Appendix D.

A comprehensive study is needed to identify potential sources of students, to define attractive study programs, and to assess realistically the number of students who would participate in an open-university program. Student motivation for enrolling in such a program should be explored, since these motives may determine the instructional strategies used to present course materials. The geographic distribution of students would be useful information to aid in the design of delivery systems. The academic background of potential students should be investigated to guide the development and production of remedial materials. Finally, the

amount a student would pay for this education should be assessed.

The question of how the total costs of an open-educational program should be met is a major policy consideration. Perhaps the nature of the study programs should determine how costs would be treated. If the studies are essentially recreational, they probably should be totally student supported. If basically academic programs, they should be treated in the same manner in which costs in traditional schools are handled: the students pay some part of the cost and the remainder is met by the institution. In some cases, such as specific vocational or retraining programs, the national interest might dictate that the State or Federal Government pay, directly or indirectly, the full cost. A similar situation might apply in the case of economically disadvantaged students.

In any case, before a comprehensive plan for the development of open universities may be implemented, data regarding students and their educational objectives must be accumulated and analyzed. The Federal Government must determine the degree to which it will want to use these schools to provide compensatory education or to cope with national manpower needs.

A. Open-University Models

Judging from the variety of schemata which the open universities already in existence have assumed, it is obvious that no single model can encompass the wide variety of educational missions these

schools are undertaking. On the other hand, a careful study of objectives, practices and intentions reveals certain common features which will allow these institutions to be characterized by the following four basic models:

The community college based system

The extended university system

The neighborhood learning-center system

The extended post-graduate professional school system

Actually, three criteria were used to select these models:

The general format of any existing or proposed U.S. open university could be characterized by one of these models.

A reasonably sized target audience having educational interests and needs which would warrant Federal support could be identified.

Technology, and, in particular telecommunications technology, could play an important part in the design of the model.

This section of the report will provide reasonably detailed descriptions of each of these four models, supplemented by notes which explore specific points in depth. Each model will be delineated in terms of four major sub-systems; namely,

Learner access systems (LAS)

Resource distribution system (RDS)

Production procurement and storage system (PSS)

Program credentialling system (PCS)

B. Community College Model

Community colleges are the most recent and innovative addition to the family of higher education institutions. They have increased rapidly, both in number and size, and now accommodate about one-fifth of all college students. Tuition is low, entrance requirements are minimal, and because of their convenient locations, they are readily accessible to a large fraction of the population. Perhaps even more important, they are still in their formative years and their institutional patterns are not as resistant to change as most four-year colleges and universities. Therefore, since these community colleges are probably the best springboard among existing higher educational institutions for experimentation with open-education systems, the first model of an open university to be described focuses on the facilities and faculty of a network of community colleges. As previously noted, the model will be described in terms of its four major component sub-systems. An administrative organization which coordinates the operation of these sub-systems and provides planning for the future will also be outlined.

1. Learner Access System

The key figure in the learner-access sub-system is the

individual learner.[1] In the case of this particular model, it is assumed that the students will be representative of the various groups now using community colleges, but with a somewhat different age distribution. Students over 23 years old will probably account for about 2/3 of the total enrollment, rather than 1/3 as is now the case. Housewives and adults who are employed full time will form the major portion of the student body. Most attendants will be more highly motivated to succeed than the average full-time student at the community college.

In addition to the learner, the learner access sub-system for this model consists of two learning-resource packages: one for use at home, the other to be used at a learning center. The home package would consist of selected or specially printed materials.[2] These materials may be a textbook, a specially designed programmed text, or reproduced sets of notes, supplemented with problem sets, workbooks, self-tests, assignment sheets and examinations. Some schools are also including audio-tape cassettes.[3] The home package would be delivered by mail, or could be picked up by the student at the most conveniently located community college. The student would probably register, for the course or courses he might want to study, at the community college nearest his home, and pick up his first home package at the same time. He would be able to register at any time of the year, since there would be no quarter or semester intervals to complicate the starting of the program.

Along with the first lesson materials, a counselor/tutor would be assigned and the student would be given instructions on how to make reservations for the use of any special learning facilities he might want to use in the course of study he has selected. A firm schedule for the completion of lessons would not be established, but some efforts should be made to pace the progress of the student even if it amounts to nothing more than periodic calls from the counselor/tutor to offer assistance and inquire about progress.

To summarize, then, the learner-resources home package would consist of printed materials and, possible, some audio-tape cassettes.

The second part of the learning-resource package, the learning-center package, would be used by the student only in an appropriate facility at a community college.[4] Individual study carrels will have to be provided in sufficient numbers to accommodate each registered student for one hour each week. Schools that have study carrels would probably be using them for their regular students both days and evenings. Therefore, the open-education program will probably require the addition of new carrels. Two configurations of learning centers will be considered. The first is a large urban center have 40 carrels and accommodating between 1000 and 1500 students a week. The second center would be more appropriate for a medium-size community and would be scaled down to only 12 carrels. They would provide space for 250 to 350 students each week.

a. Urban or Suburban Learning Center

Assume that the resource packages used at the learning centers,

which require the use of carrel space, will consist either of visual materials or of computer activities. Assume further that all visuals will be recorded on video tape, in color, when considered necessary. Finally, assume that 32 carrels would be devoted to displaying visual materials, and that the remaining 8 carrels would contain 8 time-shared computer terminals.

The learning center would be open 14 hours per day, 6 days a week, and could provide about 108,000-carrel hours in a 50-week year. If the carrels are used intensively (say 75% of the time), approximately 80,000 student/hours would be accumulated during one year; if the carrels are lightly loaded (about 45% of the time), approximately 50,000 student/hours would be recorded.

The learning center would be able to offer 300 different courses, and each course would average 15 one-hour lessons. The TV lessons would average 1/2 hour of TV programming per lesson. Some courses would use only computer lessons, but most would have only a few or no computer lessons. Assume that, on the average, a course would consist of 12 half-hour TV lessons and 3 one-hour sessions at a computer terminal. Then a total of 3600 TV lessons or 1800 hours of TV programming would be required. Also, 900 hours of computer-lesson materials must be available.

Cost per student/hour of carrel use is a basic consideration in planning a learning center. This cost will be calculated for two modes of TV use, and two levels of student loading. The

following four examples should bracket costs for any other variations of the urban center systems which might be desirable.

1. Dial access TV system, time-shared computer terminals, <u>intensive use</u>.

a) Dial access TV system (32 carrels).

	Annual Cost
i) Initial capital costs of the switching equipment and cables, program sources, monitors, carrels, and construction would be $240,000.	
Amortized over 5 years	$ 48,000
ii) Initial capital costs for 1800 hours of video tape would be $45,000.	
Amortized over 5 years[5]	$ 9,000
iii) Operating personnel and facility charges.[6]	$ 20,000
iv) Production charges for lessons.[7]	$ 36,000
v) Delivery charges for new tapes and repairs	$ 1,600
	$114,600

Initial capital requirements would be $285,000.

b) Time-shared computer terminals (8 carrels).

	Annual Cost
i) Central computer system, complete with cables $37,000.	
Depreciated over 10 years	$ 3,700
ii) 8 student terminals (teletypwriter with keyboard) would be about $16,000.	
Depreciated over 4 years	$ 4,000

iii) Operating personnel and maintenance.	$ 7,000
iv) Software costs.[8]	$ 3,000
v) Delivery charges (See TV system).	- - -
	$ 17,700

Initial capital requirements would be $53,000.

Total system annual cost would be $132,300. If the system is used intensively (or 80,000 hours a year), the cost per student/hour would be $1.65. An average 15-lesson course would cost $24.75.

2. Dial access TV system, time-shared computer terminals, light use.

Since all learning-center costs would remain essentially the same if the student-load dropped to 50,000 hours a year, the cost per student/hour under these conditions would be about $2.63, and an average 15-lesson course would cost $39.45.

3. Non-switched TV system, time-shared terminals, intensive use.

a) Non-switched TV system.

An alternative way to supply video signals to a study carrel has been made possible by the recent developments in video cassettes.[9] Starting again with a 32-carrel facility, if each carrel is provided with a video-cassette player and a color TV monitor, the capital costs of the facility now would be only about $64,000. Operating costs would be somewhat less than with the dial access system, since there would be no increase in maintenance. The only other help required would be a manager-librarian to provide students with cassetts as requested and to supervise the ordering and stocking of the cassettes.

Operating costs of $15,000 per year should be feasible; and if the facility is incorporated into an expanded library function, further cost savings might be possible. The cost

of video tape would be increased because of the need for duplicate copies of tapes and because the tapes would have to be in cassettes. Use patterns would have to establish the necessary number of copies of each lesson that should be kept in stock. Since students could start any course at any time, and then proceed at different rates, the need for a particular lesson might arise at any time. However, the demand probably would be spread out over the year fairly uniformly, so that even though a need for 32 copies of thesame tape at the same hour is theoretically possible, an average of three copies of each TV lesson should be adequate. Thus, 10,800 1/2-hour tapes would be required; the cassette-tapes would be about $22.00 for each half-hour program or a total of $237,600. A storage area of at least 250 sq. ft. with appropriate shelving would be required to store such a large stock of tapes. This stock requirement might be substantially reduced, however, if the scheduling of carrel-use was made conditional on the availability of the tape that the student would be using.

If 10,800 tapes are available to use with 64,000 hours of lessons per year, the tapes would be used only about 6 times a year on the average, so that a 10-year amortization would be conservative.

Therefore, the charges for the unswitched TV system would be as follows:

	Annual Cost
i) Initial capital costs of equipment, carrels, and storage facility would be $64,000.	
Amortized over 5 years	$ 12,800
ii) Initial capital costs for 10,800 video cassettes would be $237,600.	
Amortized over 10 years	$ 23,760
iii) Operating personnel and facility charges.	$ 20,000
iv) Production charge for lessons.	$ 36,000
v) Delivery charges for new tapes and repairs.	$ 1,600
	$ 94,160

Initial capital requirements would be $301,600.

b) Time-shared computer terminals (8 carrels).

Since the same computer system is used as with the dial access system, the same total annual cost of $17,700 will be used. Therefore, the annual cost for the complete system would be $111,860. If the system is used intensively, the cost per student/hour would be $1.40, and a 15-hour course would cost $21.00.

4. Non-switched TV system, time-shared terminals, light use.

Again, since all learning-center costs would remain essentially the same, with only 50,000 hours a year, the cost per student/hour would be $2.29, and an average 15-lesson course would cost $34.35.

The data just developed may be summarized as follows:

	Intensive Use	Light Use
Dial Access Computer System	$1.65	$2.63
Unswitched TV Computer System	$1.40	$2.29

Fig. 1. Cost per student/hour.

On the basis of the assumptions that were used to generate the data, the unswitched system is definitely less expensive to operate. There are three other advantages of the unswitched system:

a) If each carrel is equipped with a video player, the student is free to start a program at his convenience and to rerun any portion of the tape as often as might be desired. In a dial access system, this capability could be provided, but at a substantial increase in complexity and switching costs.

b) The non-switched center, with no fixed cable installations, can change available space or location more easily, at lower cost. Also, as student loads increase, they can be accommodated by constructing additional carrels and the problem of exceeding the switching capacity of the central system does not arise.

c) Over time, the price of video players will decrease and increasing numbers of people will purchase them, probably for home-entertainment purposes. In a manner analogous to the audio-tape situation, educational uses can piggyback on the entertainment motivation. Eventually, then, video materials may be added to the home-study package on a short-loan basis, relieving the learning center of scheduling problems and allowing for increased student load without adding more carrels.

A disadvantage of the non-switched system is the possible problems students might have using the players and resultant damage to players and tapes. However, all video players considered in these models would be of the cassette type. By encasing the tape in a specially designed container, tape-handling problems are almost completely eliminated, and video players are as easy to use as their audio counterparts.

Capital costs for the dial access system would be $338,000 and for the unswitched system, $354,600. It would be wise to consider leasing as much of the equipment as possible in either case for the following reasons:

† Leasing costs are treated as operating expenses, and as such are often easier to accommodate in a budget than a major capital item.

† While leasing costs would be higher than amortized capital purchases, the state of the art in equipment design is evolving so rapidly, a long-term comitment to specific equipments at this time may be unwise.[10]

b. Medium-Size City Learning Center

The same pattern of operation is assumed for this 12-carrel unit as in the case of the urban center. Nine of the carrels would be equipped with video presentation, the remaining three with computer terminals. A maximum of 50,400 carrel hours would be available. Used intensively (75% capacity), the student load would be 38,000 hours; used lightly (50% capacity), the student load would be 25,000 hours.

This learning center would offer only about 125 different courses. The same course materials would be used as in the urban case. Thus, a total of 1500 TV lessons or 750 hours of TV programming would be required. Also 375 hours of computer-lesson materials must be available.

Cost per student/hour of carrel use will be calculated again for the same four cases:

†Dial access TV system, time-shared computer terminals, intensive use.

†Dial access TV system, time-shared computer terminals, light use.

†Non-switched TV system, time-shared computer terminals, intensive use.

†Non-switched TV system, time-shared computer terminals, light use.

1. Dial access TV system, time-shared computer terminals, intensive use.

a) Dial access TV system (9 carrels).

	Annual Cost
i) Initial capital costs of the switching equipment and cables, program sources, monitors, carrels, and construction would be $40,000.	
Amortized over 5 years	$ 8,000
ii) Initial capital costs for 750 hours of video tape would be $33,000.	
Amortized over 4 years[11]	$ 8,250
iii) Operating personnel and facility charges.	$ 15,000
iv) Production charges for lessons.	$ 15,000
v) Delivery charges for new tapes and repairs.	$ 1,200
	$ 47,450

Initial capital requirement would be $73,000.

b) Time-shared computer terminals (3 carrels).

	Annual Cost
i) Three teletypwriters with keyboard terminals (about $5,250).	
Amortized over 5 years	$ 1,050
ii) Cost of telephone lines to computer.	$ 2,000
iii) Computer charges.	$ 6,000
iv) Software costs.	$ 1,250
v) Delivery charges (see TV system).	$ - - -
	$ 10,300

Total system annual cost would be $57,750. If the system is used intensively (or 38,000 hours/year), the cost per student/hour would be $1.51. An average 15-lesson course would cost $22.65.

2. Dial access TV system, time-shared computer terminals, light use.

Again, costs remain fixed, so that with only 25,000 hours of use, the cost per student/hour would be $2.31 and the average 15-week course would cost $34.65.

3. Non-switched TV system, time-shared terminals, intensive use.

a) Non-switched system (9 carrels).

Making the same assumptions as in the case of the urban center, to provide 1500 TV lessons would require a stock of 4500 half-hour TV cassette tapes at $22.00 per cassette. Used to provide 38,000 hours of instruction, the average tape use would be 8 times a year, so the initial capital cost of $99,000 may be amortized over 10 years.

The charges for the unswitched TV system would then be the following:

	Annual Cost
i) Initial capital costs of equipment carrels and storage facilities would be $33,000.	
Amortized over 5 years	$ 6,600
ii) Initial capital cost for 4500 cassettes would be $99,000.	
Amortized over 10 years	$ 9,900
iii) Operating personnel and facility charges.	$ 15,000
iv) Production charges for lessons	$ 15,000
v) Delivery charges for new tapes and repairs.	$ 1,200
	$ 47,700

Initial capital costs would be $132,000.

b) Time-shared computer terminals (3 carrels).

Charges would be $10,300, the same as for the dial access system. The annual cost for the complete system would be $55,800. Used at 75% loading, the cost per student/hour would be $1.47, and an average 15-hour course would cost $22.05.

4. Unswitched TV system, time-shared computer terminals, light use.

Once more, since learning-center costs are insensitive to loading, with only 25,000 hours a year, the cost per student/hour would be $2.23, and the average 15-lesson course would cost $33.45.

	Intensive Use	Light Use
Dial Access Computer System	$1.51	$2.31
Unswitched TV Computer System	$1.47	$2.23

Fig. 2. Cost per student/hour.

c. Additional Learning Facilities

A particularly attractive feature of the community college model is the range of facilities in addition to carrel-equipped learning centers which can be made available to students. Computer terminals have been incorporated into the learning-center carrels, but it may be possible to provide the desired computer access as a part of the college-computer system. Under such circumstances, costs for computer time, communications and maintenance may be substantially reduced.

In addition to computer facilities, the community college has a wealth of laboratories and shops. Many courses will be improved if a weekly lab can be scheduled. Those students taking courses with a vocational emphasis would find the shops an essential aid for developing specific skills.

Most colleges have a good library that students could use for reference materials and as a study area. In fact, the learning center may be just an expansion of the library in some schools.

As in the case of the learning-center carrels, scheduling of lab, shop, and other special facilities will present problems, particularly if an attempt is made to accommodate student desires. However, most college-lab space is greatly underutilized, so that with some administrative effort, open-university students could have a reasonable choice of access times.

In summary, the learner-access system for this model consists of the learner; the home-learning resource package; the learning-center resource; and the learning facilities which are a major reason for using the community colleges as the center of activity in this model.

d. Provision for Student Feedback

Student feedback is required to assist the student in his understanding of the lessons and, equally important, to identify lesson materials which need additions or revisions.

The student would be able to contact his counselor by appointment at any mutually convenient time. The learning center would have some personnel on duty at all times, but they could not be resource help in more than a few of the courses and would be concerned mostly with the operational problems of the system.

The home-resource package would contain assignments which would either be mailed back to the school, or handed in during a carrel lesson. Faculty time would be allocated to review this homework and to provide the student with suitable comments. The audio cassette may prove useful in this process if instructor comments are recorded and returned to the student. The oral feedback may help to humanize the process.

As much as possible, examinations would be self-corrected, since, in many courses, there may be no grade assigned. Even when pass/fail or letter grades are desired, self-correction procedures may be used which provide a record of student errors for evaluation purposes. The examination results would be reviewed by assigned faculty and by at least one person with special training in curriculum evaluation (although the major evaluation effort would be undertaken at the production center).

The availability of computer terminals in the centers would allow some examinations to be computer-administered and evaluated. These examinations need not be confined to jost those associated with the courses that use the terminals, but, if scheduling allows,

could be used for other course examinations as well. The computer capabilities could be used to devise more sophisticated tests than the usual written examination. The computer could also provide the student with corrections and a grade as soon as the test was completed. Evaluation data would be automatically stored and processed for later use.

e. Provision for Faculty-Student Interaction

An estimate can be made of faculty time that would be required to support the centers used in this model. Student-faculty reaction would occur at various times and for various purposes. During initial registration, perhaps an average of 1/2 hour would be needed for student counceling and orientation. An average of 3 examinations and 10 homework assignment would be associated with each course. Assuming that the exams would be self-corrected by the students, these student responses would require an average of 6 hours of review and comment. Finally, an additional 1½ hours could be allocated to special help or discussions with the student as needed or requested.

Thus, the total faculty time per/student per/course would be about 8 hours, if these estimates are realistic. Probably about half of that time could be provided by student aides or junior faculty. Since faculty in many community colleges are expected to devote at least 20 hours a week to their teaching duties, each year, a senior faculty member could handle about 75 students in

three courses. If the annual salary of a senior faculty member is assumed to be $15,000, the cost per/pupil per/year would be $200, or about $67 per/student per/course. If the average cost per hour of junior faculty or student aides is assumed to be $3.50, the 4-hour per/student per/course requirement for this type of assistance would cost about $14. So, the combined cost per/student per/course for faculty-student interaction would be $70.50. If we add to that the $25 to $40 cost of the home-study and learning-center resource packages, the total cost per/course per/student is about $110, or $330 a year (if a student takes three course a year).

Another statistic of interest would be the total faculty manpower needed to support a learning center. In the case of the urban/suburban-size center, an average of about 1500 students a year must be accommodated. If one senior faculty member can work with 75 students a year, a total of 20 full-time faculty would be required. In addition, 6000 hours of junior faculty or student aide assistance would be required, or another 3 or 4 full-time equivalent instructors.

It is unlikely that any senior faculty would be associated full time with the program, although it may account for a major portion of the time of a number of teachers. The breadth of subject matter covered by 300 courses would probably require the assistance of 60 to 100 different instructors. Without the advantage of the

college association, there would be a problem of providing a breadth of faculty capability. The regular college teaching load justifies the full-time availability of a wide range of content and competence.

In the case of the smaller-size learning center, the faculty requirements would still be quite significant. If the student load is assumed to be about 800, 10 full-time equivalent senior faculty would be required, and about 3200 hours of junior faculty or student aide assistance would be required.

2. Resource Distribution Systems

A learning-resource distribution system transfers learning materials from production or procurement sources to the individual community college learning centers. In their simplest form, these systems depend upon the mail or messenger services. However, as cost of mail service continues to increase, speed and reliability seem to decrease in proportion. As labor costs increase, so do messenger services. Finally, the value of telecommunication systems as a means for delivering educational materials has become well-established as TV networks grow and new computer networks are planned. Therefore, the possible uses of telecommunications in this model will be carefully explored.

If time-sharing computer terminals are used by the school, a digital network, probably using telephone lines, is being used. If the network is a commercial service, a considerable range of

programs could be available, and special arrangements for memory storage could be made, but the basic control of the network would remain with the commercial organization. Also, telephone charges might become a major part of the service cost, if the computer is located at some distance from the school.

An alternative arrangement that is developing in New York State, for example, is the establishment of regional centers, known as the Board of Cooperative Educational Services. Among the services provided to school districts by these BOCES, is access to a large digital computer, principally for accounting purposes with the intent to accommodate instructional applications as they develop. Since these centers serve the elementary and secondary school systems, they may not be of immediate use in developing this model, but they can serve as a pattern for resource-sharing and, perhaps, their operations could be expanded to provide such services at the college level as well.

Another important group of telecommunications networks are the state educational TV systems. In most cases, these are broadcast stations with microwave or cable interconnections. In addition to their braodcast signals, they often have associated production facilities. As noted earlier, this model does not include broadcast TV as a <u>real time</u> delivery mechanism to the learning centers because of the inflexibilities it would introduce. However, used with suitable storage devices, such as video recorders, new possibilities

may be introduced. Such possibilities will be explored as an alternative to the messenger or mail delivery system already postulated for this model.

Before doing so, however, two other advances in the telecommunications scene should be mentioned; namely, the cable TV systems and the satellite systems. Cable TV systems were started as a means for improving the reception of entertainment TV, but the 20 to 40 TV channels that can be accommodated on a modern cable provide opportunities for a host of new applications, including transmission of educational materials. Many communities require as a condition for a franchise that the cable company provide at least one free channel for educational purposes, and also that they provide each school with a free cable termination. By taking advantage of existing facilities paid for by other services, educational materials may be transmitted at essentially no cost. However, the restriction to one channel introduces the same inflexibilities as with the broadcast signal, plus the further restriction that the program can reach only those people who are on the cable. Dedicated cable systems could overcome these objections. Although costs are a consideration, once installed, the operating costs for a large installation may be as low as 1¢ per/channel per/day for each cable termination.

Costs of communication services are often the major portion of the operating budget for schools using computers or closed

circuit TV. The use of satellites as a communications link for educational purposes may be a viable alternative solution for long-distance transmissions, particularly in remote areas with rugged terain. The HEW Rocky Mountain region project, using the ATS-F experimental satellite, will be operating in such an area and is expected to provide valuable data and experience within the next two years.

a. Lowest Level Network Design

Delivery systems suitable for use with the community college model require that assumptions be made regarding the location of the learning centers, the transmission facility, and the distances between them. The idealized arrangement shown in Fig. 3 will be used as a vehicle to explore two alternate methods of delivery; the first being the broadcast mode, and the second being the use of wide-band cable.

1. Broadcast Mode

Assume that the central transmitter is an ITFS station having an allocation of 4 microwave channels. Also assume that each learning center has the tuners and converters necessary to receive all 4 transmissions simultaneously. Finally, assume that each learning center is of urban/suburban size, having a capacity of 40 carrels, 32 of which use video presentations. To reduce the capital investment in video tapes required if each learning center has its own full set of lessons, all TV master tapes will be stored at the transmitter site. The problem, then, is to devise an operational

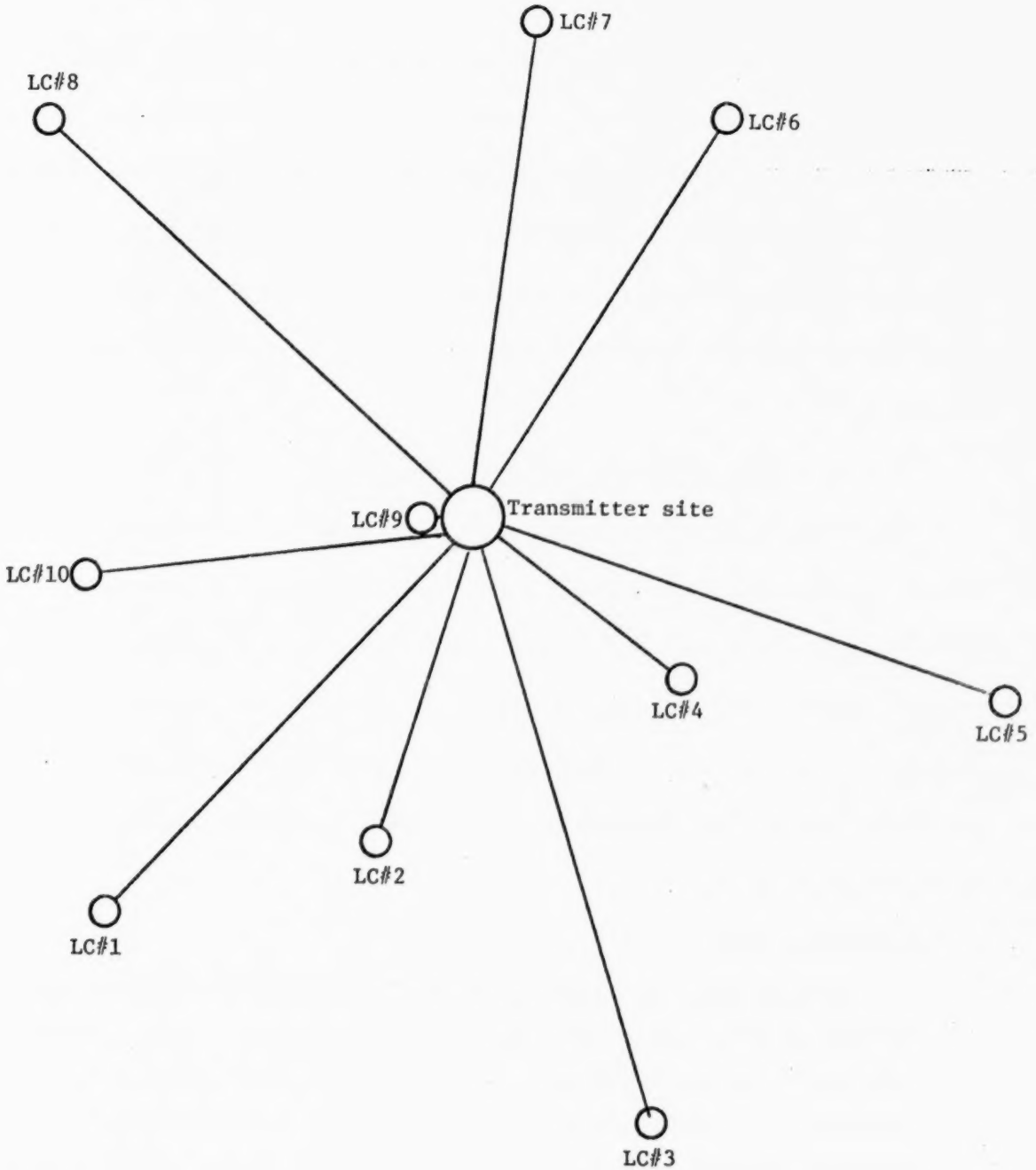

Fig. 3. Combined distances from transmitter to all learning centers is 100 miles.

procedure that will deliver the programs to the centers at a reasonable cost and still provide the student with a wide choice of program selection and viewing times.

Obviously, the lowest cost procedure would be to broadcast all lessons on a predetermined schedule and ask the learning centers to schedule their students so they could view the programs as they are being broadcast. This arrangement would suffer from all the inflexibilities of the real-time broadcast, even though there would be 4 programs available simultaneously.

The only way to avoid the restrictions of real-time transmissions is to provide some memory in the system. This could be accomplished if each learning center were to add 4 video recorders to their receiving system, thereby permitting the continuous recording of all broadcast programs.

If the transmitter were operated 23 hours a day, it could broadcast 184 half-hour lessons. However, since the 32 carrels at each center would be used an average of 8 hours a day, and since maximum freedom to select lessons is desirable, as many as 256 different lessons could be needed at each of the learning centers. So, considering the possible student needs for all 10 centers, at least 1 student might want any one of the 3600 lessons every day. The transmitting station obviously could not provide such freedom of choice, but with some restrictions in scheduling, the 184 time-slots might be adequate to provide the student with a wide selection of programs and a preference of viewing times. To accomplish this, each center would order their programs two days in advance. The program orders would be consolidated at the broadcasting facility, and the 184 most frequently requested programs would be broadcast the day before they are scheduled at the learning centers. The transmissions for each day would

be listed prior to the first transmission of the day, and the learning centers could then make arrangements to record any of the lessons which they would need for student use the following day. Students desiring programs not among the 184 selected would be to be rescheduled. Special consideration would have to be given to courses with low enrollments, otherwise their lessons may never be broadcast. Perhaps a rule that any lesson must be transmitted within one week of the first time it is requested, would be a satisfactory solution.

Whereas the scheduling problems at the learning center certainly would be increased, the compensating advantage would be a major reduction in tape stock. Essentially, only a 2-day supply of tapes would be required -- one half would be used for recording; the remainder to provide student lessons the same day. Using a dial access system to minimize the need for duplicating tapes, a stock of about 400 half-hour cassette tapes would be sufficient.

Starting with the dial access TV system previously described, but now using the broadcast mode of tape delivery, the cost of the modified system would be as follows:

		Annual Cost
i)	Capital costs of dial access system, plus extra recorders, monitors, tuners, and converters, would be $255,000.	
	Amortized over 5 years	$ 51,000
ii)	Costs for 400 half-hour cassette tapes.	
	Amortized over 1 year	$ 10,000
iii)	Capital costs for central transmitting facility would be about $400,000.	
	Amortized over 10 years, divided among 10 schools	$ 4,000

iv) Operating personnel and facility charges.	$ 25,000
v) Production charges for lessons.	$ 36,000
vi) Pro rata charge for operating costs of the central transmitting facility.[12]	$ 3,650
	$129,650

Initial capital requirements would be $255,000.

An additional $400,000 capital charge would be incurred to set up the central transmitting facility.

Assuming intensive use, the broadcast mode would provide instruction at a cost per student/hour of $1.84, if costs for the computer system are unchanged. Considering the scheduling complications introduced, this doesn't seem to be an attractive alternate.

2. Cable Mode

An alternative system would use 20-channel broadband cables in lieu of the microwave links. By increasing the channel capacity from 4 to 20, a different operating procedure could be used. The transmitting station would now send out programs 23 hours a day on each of the 20 channels, providing a total of 920 half-hour time slots every day. With this increased capacity, it would be possible to transmit more than 3600 different lessons every four days. Once more, considering the urban-learning center, 3600 lessons would cover the complete stock of lessons offered by the center. Therefore, if the centers are equipped with video-recording equipment, and if they arrange their schedules one week in advance, they should have time to record any lesson they need from the cable. Used in this mode, it should be possible for the center to work

with an unswitched system and still provide the students with complete freedom of lesson selection and time of viewing. To do this, the center would need a number of recorders to handle two situations: one when several different programs must be recorded simultaneously, and the other when multiple copies of a particular lesson are required. Only experience could determine the minimum number of recorders that any given center would require, but 10 recorders would probably be adequate.

The principal advantage of this delivery system would be the reduction it would permit in tape stock required by the center. The center could operate in the unswitched mode with the same number of tapes as would be used with a dial access system instead of three times that number as is usually the case. For an urban center, 3600 half-hour cassettes would be required. This number of tapes would allow the learning center to offer students the use of an average of 1800 different lessons each week and have an additional 1800 cassettes to use for recording lessons for use the following week. Theoretically, it is true that, in any week, all 3600 lessons may be needed, but such a uniform distribution of lesson requirements is highly unlikely. The assumption, then, has been made that each recorded lesson will be used at least twice during each week.

Starting then with an urban center having an unswitched system, providing 32 carrels with a video presentation, the cost of a cable-based delivery system would be as follows:

	Annual Cost
i) Initial capital costs for equipment and carrels would be about $99,500.	
Amortized over 3 and 5 years[13]	$ 24,566

ii) Initial capital costs for 3600 half-hour cassette video tapes $90,000.

Amortized over 5 years[14]	$ 18,000

iii) Central transmitting facility would be a capital charge of about $100,000. A dedicated cable system would cost about $10,000 per mile, so for a 100-mile system, capital costs would be $1,000,000.

Amortized over 10 years and 10 users	$ 11,000

iv) Pro rata charge for operating costs as the central transmitter.	$ 5,000
v) Operating personnel and facility charges at the learning center.[15]	$ 33,480
vi) Production charge for lessons.	$ 40,000
	$132,046

Total capital investment would be $189,500 at each learning center and $1,000,000 for the transmitting equipment and cable network.

Assuming that the computer costs are unaffected by the change in delivery system, since the system is self-contained at the center, and assuming intensive use, the cost per student/hour would be $1.87. The cost for an average 15-hour course would be $28.05. This cost per student/hour is comparable with the other systems which have been analyzed, but the capital costs are much higher.

There are a number of factors that could substantially change some of these cost estimates. If a 40-channel cable were available, the transmission day could be reduced to 12 hours. By using the 12 hours a day that the learning center is not open for students,

and by replacing 10 or 12 of the 32 video players with video recorders, the amortized cost of video equipment at the learning center could be reduced by $3000 per year. The transmitting studio-equipment cost would be increased to cover the cost of 20 more video players, but the additional cost to each center would be only about $600 per year. The savings in operating cost realized by cutting the transmitting time by one-half would more than compensate for this extra equipment cost.

The expense of the cable system is another cost-area that involves potentially great variations. Such costs may run from $5,000 to $30,000/mile or more, depending on the fraction of underground cables which are used and the degree to which the area is urbanized. Also, the assumption that the system would be a totally dedicated, fully owned system might not be cost effective in many circumstances. If the telephone company, or other companies with communications networks can provide the necessary service at reasonable, competitive costs, the transmission-network cost could become an operating expense rather than a capital change and, as previously noted, this often is an advantage in obtaining budget approvals. Telephone charges for ITV cable run about $35/month/mile/channel. With 20 channels, monthly charge for 100 miles of cable would be $70,000/month, which is considerably more than the cost of the dedicated system. However, if a broadband cable could be made available, these expenses might be reduced.

The choice of 100 miles as the extent of the cable network is also quite arbitrary. There are probably a limited number of areas where 10 community colleges could be found within a 10-mile radius of a transmission center. Any actual delivery system probably would combine cable and microwave links. The actual network design can be worked out only when specific distances, locations and terrain are known. However, cost per student/hour of lesson presentation for the various delivery modes is remarkably similar, indicating that designers could have a fairly wide latitude in their choice of system details without introducing major changes in the overall cost of operation.

b. Need for Higher Level Networks

At least 10 states have 10 or more two-year colleges which might participate in an open-university system as envisaged in this model. In those states, a second-level network interconnecting the transmitting centrals would be useful. In many cases, this network would already be in place as a state ITV network. The main purpose of a second-level network node would be to house the major learning-resources production activity for the state open-university effort. It could also serve, however, as a secondary storage facility for special course materials which are called for infrequently, for new materials during pilot-evaluation studies, and as a studio to record and duplicate video cassette master tapes. In addition, the facility could serve as a station for any national

information of data network. This type of network might be set up to make available resources from major national data banks such as the Library of Congress. Finally, this facility could provide studios and TV network interconnections to furnish real-time programming of selected events so that such programs could be made available to individual learning centers supplementing their normal course packages. Each center should have some space for small group discussion equipped with a TV monitor. The monitor could be connected to the converter/tuner on one of the cable or microwave incoming channels, so that, even in an unswitched center, any program from a higher level network node could be seen by a group of students.

It is assumed that the second-level network will be able to transmit video signals, since most states already have invested in such networks. The need for parallel digital data transmission networks is more recent, but is developing to accommodate centralized computer services, and to link any national data-transmission system which might be created.

If second or higher level systems are incorporated into the open-university system, additional costs will be introduced. Cost of the production activites has been provided for in the individual learning-center budgets, but the remaining services would require extra charges. Assuming that the capital plant exists and that the major portion of the programs transmitted are for the purposes

other than the open university, these extra charges may be quite nominal. If special communications links have to be built to reach some of the hub transmitters, however, and if programming in real-time is used extensively, charges of 10¢ or 20¢ per student/hour must be added to the previously calculated costs. Since conditions vary so greatly from state to state, no provision for this additional network cost will be made in overall system-cost calculations, but the price of these links (if they are needed by any particular state to reach a central production facility) must be considered.

c. Network Management and Financing

Since most community college programs have become part of state university systems, a management structure exists at the state level. Nonetheless, it is essential that the open-university system have a separate administrative structure starting at the State Education Department or state university level. This arrangement will lead to difficulties in coordination of staff and facilities at the individual schools but it is the only way that an innovative open university can avoid being rapidly absorbed and transformed into the traditional format of higher education.

Budgeting practices should follow management lines so that responsibilities are backed up with financial resources and financial responsibilities. The cost per student in the open-university program should be less than in the conventional state

universities and colleges,[16] and maintaining a low cost would be a major goal of the administrative organization.

3. Production, Procurement and Storage System

All studies of the open university agree that the learning resources used in an open-education system must be of the highest quality. The most distinguishing characteristic of the British Open University is not the occasional television or radio program it uses, but rather the extraordinary care and skill that has gone into the design of learning resources tailored to a specific clientele. Also, the British intent to fully utilize all media in designing their materials is generally accepted as highly desirable, but, as the British are learning, production of high quality programs involving TV or film is very expensive.

The only way that high quality materials may be provided to students at a reasonable cost is to increase considerably the number of people who will use the materials. In the traditional schools, the sharing of learning resources has been confined principally to textbooks. Furthermore, as long as the teacher is the main dispenser of fact via numerous lectures, any non-book materials tend to parallel lecture presentations, and merely add inconvenience to the teacher and cost of the course. As a result, without a major change in teaching strategies, effective use of non-print media in the established higher education institutions will be infrequent and will always be treated as an extra cost.

The open-university model being developed in this section is well-suited to the extensive use of both high quality print and non-print materials. Instruction has been individualized and the faculty is not expected to dispense facts, but to clarify and challenge. Therefore, the usual barriers to shared materials have been removed and savings resulting from sharing good learning elements are possible. In fact, if appropriate reward mechanisms are furnished, faculty members can participate in the production of non-print materials and obtain royalty payments in a manner analogous to the usual textbook-royalty arrangement.

The principal production agency for this model will be the highest level network node; although some production capability is desirable at lower-level nodes, as well. It is quite likely that the lower-level network node would be at one of the community colleges, and would have some production facilities and skilled personnel available. Essentially, any second-level network nodes must have good production facilities and personnel.

As previously mentioned, a market survey of potentially successful course offerings is a fundamental national task. This survey should be supplemented by state, and perhaps even county, studies to determine levels of interest in programs suggested by the national survey, and to ferret out special regional interests that might not have been detected in the broader study. The course list derived from these surveys will be supplemented, if

necessary, by enough traditional college courses to allow a student to meet the conventional degree requirements.

Having selected the desired courses, the production/procurement task would begin in earnest. A wealth of useful media curriculum materials already exists, even though a comprehensive inventory has not been compiled yet. The Technological Applications Project sponsored by the U.S. Office of Education, and the video tape libraries at Lincoln, Nebraska, and Bloomington, Indiana, are three of the agencies trying to meet this need. Film libraries exist in most libraries and in county and state collections. A number of companies (such as McGraw-Hill and the Film Board of Canada) are developing excellent collections of instructional films. However, most of the commercial media materials have been designed for elementary and secondary school use. The auto-tutorial materials developed for use in biology, several versions of TV courses in psychology, and an excellent TV calculus course available from MIT, are some exceptions, but the general reticence of college faculty to use any media materials has discouraged extensive production efforts. The open-university pattern of instruction can change the situation and, in fact, can greatly encourage production of quality materials at the college level.

Efforts to locate and evaluate existing materials must continue. In addition, there will be a need for adaptation and for new production efforts, if all lesson materials are to be presented

in either a video or computer format as envisaged in this open-university model.

Both adaptation and new production could be accomplished at the state-level network nodes. The adaptation task probably would be the easiest, involving primarily a conversion of tape/slide or film presentations onto video cassettes. This operation could be relegated to technicians for the most part, but, if high quality is to be maintained, the essential differences between these media forms must be recognized. For example, video is a low-resolution, close-up medium; whereas film is high resolution and can be used effectively for panoramic scenes. If the film-to-video transfer is made without recognizing the video limitations, the resulting product will not be of high quality. The conversion process must be supervised by media and instructional specialists, and if substantial modifications are proposed, the content specialists should also be consulted.

A comparable problem would occur in adapting computer programs for use throughout the network. Program conversions are likely to be major tasks and may tend to limit the sophistication of computer use in the early phases of the curriculum development.

Conversion costs are an additional expense and must be justified by savings in delivery charges and in providing truly convenient use.

Production costs in any format vary widely, but a high quality

16mm movie film will cost about $1000 per minute or about $30,000 for a half-hour lesson. Conversion to video cassette would cost $80.00. If the film required editing and new footage before conversion, additional costs would ensue.

Initial production of the majority of lessons in the slide/tape mode may be highly desirable for a number of reasons.

1) Production costs are less than either film or video. 100 35mm slides and 1 reel of audio tape will provide adequate media support for most half-hour lessons. Such a package produced professionally should not exceed $5000. Conversion to video cassettes would be the same cost as for film, but if any editing is required, the expense should be nominal since substitution of slides is not complicated.

2) Production tools are generally available. Many people own high quality 35mm cameras and have developed skill in using them. The advent of the cassette recorder has made sound recording anywhere a relatively simple operation. Audio studios are generally available and hourly rental fees are moderate. As a result, almost any teacher could prepare materials in this format. This possibility could greatly increase the number and variety of lessons in a mode which could be used throughout the system. Details of a plan to ensure high quality results, using these teacher-produced materials as a basic resource, will be included in the recommendation section of this report.

3) The TV frame grabber which has been designed by the Mitre Corporation and which has been mentioned previously, uses still pictures as a basis for their time-sharing of a single-cable channel. The potential frame rate is about

10 times faster than the usual slide/tape package would require. If materials are designed for use with this device, they might use more pictures per minute, or the number of programs that can be time-shared would increase.

The argument about the need for motion in the visual support media used in instructional materials is waxing hot, but with little conclusive evidence so far. It may well be that the use of motion does not make a significant difference if the slide-sound package is given truly professional treatment. This conjecture should be reviewed in the light of good experimental data because, if the efficacy of still pictures can be confirmed, it could have a major impact on price and program availability.

If a major video production effort is undertaken, current facilities for these purposes should be fully researched before construction of new production centers. The higher network nodes which have been considered potential video production sites usually have good facilities, or access to facilities in a nearby university instructional-resources center. Upgrading a facility will be much less costly than creating new facilities, and this policy should guide any program of support.

Video production costs, which have been mentioned previously, have been estimated at $10,000 per hour. High quality video is usually priced closer to $50,000 an hour. The use of the lower hourly cost is based on the assumption that some sizeable fraction of the programs will be classroom presentations expertly recorded. Many people have been able to learn from this type of TV lesson, and, while its use is generally opposed by the professional TV broadcasters, cost considerations recommend that appropriate

applications be actively sought.

The sharing of resources on a national level will be enhanced if there is an attempt made to coordinate the state-level production programs. As a start, an information service should be provided so that all production centers are aware of the activities of all the other centers. As a further step, the inception of a national curriculum development program (beyond the effort that the National Science Foundation has made for science) could introduce competitive bids for production support. Course specifications could be developed as initial study contracts let to several qualified production centers. Evaluation of these initial studies would result in the award of a major production contract with sufficient funds to support a high quality effort. In many cases, the programs might be based on already existing materials, and such proposals should receive preferential treatment. The contract need not be unqualified grants. Provision could be made to encourage the contractor to introduce the course into his associated networks with a profit-sharing scheme based on use that would return some funds to the government.

In addition to the production facilities at the network node, two other activities would be pursued. The first would be a simple inventory and storage function to keep track of all stock and supervise all shipments; the second activity would require a staff for evaluating the course lessons. This evaluation would start at the inception of any production program, continue through all pilot programs, and include the accumulation and review of all evaluation data obtained from the centers on all lessons being used in the network. By constantly evaluating

materials and incorporating the results into lesson revisions, the quality of the courses will be continuously improved. Costs of this process would be substantial and should be included in any production budget as an integral activity.

A major problem for all production centers will be operating complications introduced by copyright law. The highly desirable practice of building on already existing materials may not be possible in many instances, unless special arrangements can be worked out with the authors or owners of the material. Also, the faculty will insist on appropriate rewards for participation in lesson preparations and such rewards should be provided. A return based on use would be a possibility.

4. Credentialling System

To sustain any open-university effort, students must be able to document their achievements with credentials which will be accepted by their peers and, in particular, by potential employers. For this model, close association with a community college will probably simplify the problem. The college has the authority to grant credits and degrees. As an integral part of the college, the open university could use that authority to provide credentials for its students.

There is one major complication. Since community colleges are two-year schools, they offer only an Associate degree. Also, in the case of some community colleges, transferability of credits may be a problem, if the student decides to continue studies toward a higher degree at another college.

Even so, there are several extenuating considerations. Some open-university students may not be interested in credentials, either already having degrees or being well enough established vocationally that mastery of new skills could provide its own reward on the job. For those younger students with vocational goals, the Associate degree may be adequate.

Those students who are seeking a Bachelor's degree may have to turn to external examination programs. The Board of Regents of the State of New York has established two such programs which could be used as patterns for other states. The College Proficiency Examination Program (CPEP) has been certifying proficiency in over 25 subjects since 1963, and the certification is usually adequate to obtain course credit in a four-year college. The new Regents External Degree Program offers an Associate in Arts degree in 1972 and will offer an Associate in Applied Science in Nursing, and a Bachelor of Business degree in 1973. Additional degrees will be offered in the future. Certification by the CPEP program is always accepted for the Regents External Degree Program.

One other possibility for obtaining course credits is the College Level Examination Program offered by the College Entrance Examination Board. CLEP scores will be evaluated for credit by most colleges. So there are mechanisms whereby a student seeking credits or even a degree could take a course at the open university and then obtain credit at any other school, or even obtain a degree

without enrolling in another college. To accomplish this, courses above the second-year level would have to be included in the open-university curriculum. Since there would be no equivalent courses in the community college, there may be complications regarding qualified faculty to serve as tutors, or finding suitable laboratory facilities. A critical consideration would be the number of students enrolling in the open university that would be seriously pursuing a four-year or advanced degree. Probably, only operating experience will provide an answer to this question.

C. University Based Model

The majority of the open-university programs in being or in planning are associated closely with one or more universities. For example, in New York, Massachusetts, California, Wisconsin, Nebraska and Florida, the open schools are being developed as a part of the State University System. At least two ventures, the Antioch-based University Without Walls, and the Syracuse Research Corporation program, are examples of consortia, a group of schols having a common open-education program. Another group of schools (Stanford, University of Florida, Southern Methodist and Colorado State) have been developing programs in graduate professional education and will serve as the basis for the fourth model covered in this report.

1. Learner Access System

While varying somewhat from school to school, in essence,

the goal of these programs is to serve people who, for various reasons, have not had opportunity for, or have not taken advantage of, as much education as they need and desire. Generally, the expected clientele are high school graduates, often with one or more years of college experience. These students are mostly in the 29 to 45-year bracket and include a large fraction of women. Some 18 to 24-year olds probably will be attracted by the freedom to "drop in" and "drop out" and to pursue studies over a wide geographic area. The open schools are not intended to rival the educational programs of the parent universities; however, because of their common administrative channels, the open programs will have to compete for funds with well-established and often prestigious institutions.

The home-learning resources package is likely to be confined to printed materials and audio tapes. The students will be encouraged to enrich their home study with whatever aids they can find, and appropriate supplementary materials will be suggested by the assigned faculty such as books, workbooks, and notes. However, pre-planned programs of specially designed learning materials for home use will be available in only a few cases.

Because of the close ties this model of the open university has with one or more traditional universities, a substantial portion of the learning package will be accessed at the main campus of a university, at a branch campus, or in a special learning center

administered by the university. Most non-print media will be viewed at these locations, requiring some students to travel long distances in more sparsely settled states.

The learning centers are likely to be a part of the parent university and will be equipped with carrels and presentation devices which are normally used in the regular classes of the school. In many ways, the situation will be similar to the community college model, except that open-school students are less likely to experience special treatment and special courses.

Faculty can be made available to provide guidance and special assistance if the reward structure can be arranged to make the task competitive with research and lecturing activities. The level of faculty loading proposed for the community-college model would probably be unacceptable at most four-year schools. Since, in the community-college model faculty contact costs were more than two-thirds of all costs, increased teacher costs would make the program more difficult to finance and might seriously restrict the number and type of students who can be accommodated. One alternative would be the use of graduate students extensively. The large fraction of foreign graduate students complicates the implementation of this approach, since language difficulties can greatly reduce the effectiveness of an instructor. However, enough properly qualified students and junior faculty might be encouraged to participate to man most of the routine student contact requirements;

senior faculty could provide special attention and build motivation.

2. Resource Distribution System

Most of the distribution mechanisms used in the community-college model would be applicable to this model. Many state ITV networks are closely associated with the State University, and, in such cases, the TV channel is potentially available. However, previous commitments would probably limit available time and a single channel of TV, even if it is fully dedicated to an open-education program, can service only a limited nuber of courses.

a. Lowest Level Network

Considering the constraints of close association with traditional four-year institutions, the two most practical delivery systems for this model are by correspondence (using both printed and audio materials), and by student attendance, in more or less conventional classrooms, to the basic curricular offerings of parent institution or institutions. Considerable prose can be generated to give the image of a significantly different program, but careful examination of actual practices often reveals a modified program but one still tied to most of the activities of the traditional universities. Formal entrance requirements, defined courses of study, prerequisite requirements and examination formats are relaxed or removed, but an extensive counselling program is added and what is formally eliminated can, in large part, be informally reinstated. Many innovations proposed for the open

programs in this model are already established practices in other conventional schools, such as work-study programs, the independent study semesters, and the correspondence practices of the university extension division. It is not surprising then, that the primary delivery systems are most likely to be the traditional classroom format or a more sophisticated form of the correspondence program of the extension or continuing education program. This is not to say that such systems are not effective; the work of some continuing education divisions such as the ones at the University of Wisconsin and the Pennsylvania State University are already open-education systems of maturity and strength. However, the principal lack in these delivery systems is the existence of convenient learning centers which extend the resources of the school into a wide area and have the necessary technology to economically provide a student access to learning materials and equipment that, as yet, cannot be included in a correspondence learning package.

b. Higher Level Networks

Higher level delivery networks would be desirable for providing university access to state and national data banks and TV productions. However, the economics of such networks are still uncertain. If subsidized by the federal government, the services would be welcomed,but as an additional cost to the university, only certain selected services of interest to a research group or a library function are likely to become viable. In any case, the services

would be instituted and used for all parts of the university and should not be considered as a special activity for use only by the open-education program.

3. Production, Procurement and Storage System

The primary production effort for this model probably would be the outgrowth of a university learning resource center, the curriculum development group associated with a continuing education program or both. Facilities could vary from marginal to excellent.

Since the predominant mode of delivery would probably be classroom or correspondence, the production efforts will be principally print-oriented and any non-print media is likely to be supplementary in nature. Students are often encouraged to undertake independent study -- thereby relieving the teachers from most of the responsibility for preparing or identifying specific learning materials. Certainly, the long-term goal of higher education is to develop self learners, but learning skills develop slowly and an excessive amount of student time can be spent trying to locate basic data, or to master, unaided, required techniques and skills. Students locked into traditional higher education may feel that they are obliged to accept inefficient learning practices but, except for a small fraction of highly motivated people, the potential open-education student is likely to bypass courses which do not provide structured learning assistance.

Production costs of printed materials are usually priced less than the non-print media. In higher education, book publishers have acted as brokers for most written materials and, using potential royalties as an incentive, have capitalized on the important prestige value which attends authorship in the academic community to encourage many people to produce written materials at a very low hourly rate. If all such writing were rewarded at the same hourly rate as other academic duties, costs for printed-lesson material would be comparable with tape/slide or moderate level TV production. Estimates from the British Open University experience indicate costs of about $3,000 for one hour of instructional material would be required for highest quality materials, and $1,000 per hour is an economy operation. The fact that the preparation of written materials for education are seldom supported at even the lower level may explain the relatively low quality of many of these materials.

If specially written books and workbooks are desired, a high quality 42-lesson course would cost $126,000. At $30/student/course, enrollment of 4200 students would be required to cover the production cost. Assuming the materials have a 5-year life, an annual student load of 840 would be needed. Except for some basic courses, the likelihood of such enrollments at any one open university are small, and the development of course-sharing practices between schools is imperative. Unfortunately, this

model, involving as it does the conventional four-year colleges with their reluctance to share learning materials, will be the most difficult model to follow, if extensive resource sharing is to be implemented.

On the other hand, one of the strongest features of this model would be the potential availability of production and evaluation talent. All elements of successful production teams, such as content experts, media specialists and curriculum designers would be resident resources. Journalism and education students could aid in production activities. The psychology and education facilities could provide skilled evaluation practitioners, and computer facilities and special subroutines would undoubtedly be available to process such data.

However, mechanisms for insuring the cooperation of all of this talent will also have to be devised. Special grants, released time or part-time employment are the types of incentives which may be necessary and these may not be adequate if the associated activity does not have academic prestige or, stated more crassly, does not count toward promotion. So, while talent is in evidence, using it to advantage might be a problem.

The production activities, if already in existence, would report to a Dean or Vice President and would have a role wider than just to develop materials for the open-university arm of the school. The open-university director may find this an unsatisfactory

arrangement and be tempted to build up his own production group. In some cases this may be desirable or necessary or both; but in most cases, because of cost limitations, it is likely to lead to understaffed facilities manned with mediocre talent.

In any open-university model, quality resources are essential and the production of non-print materials from any particular university might be enhanced if a market existed for the products. As previously noted, sharing materials between universities, particularly for use in the classroom, has little precedence or popularity. However, if learner-access systems in other models are interested in providing the best lesson materials regardless of source, a market for high quality productions will be generated. Not only could the university be compensated for the production costs, but the principal authors could receive both recognition and royalties comparable with that obtained from their published books and papers.

4. Credentialling System

In this model, credentialling is simple. Since the parent institution is a degree-granting organization, credits and degrees may be arranged and awarded by the established component of the institution.

An interesting exception to this procedure is the degrees granted by the University Without Walls (UWW) consortium. Students in the UWW receive the degree from the participating college which

he attends, but the degree is a Union-UWW degree. The Union refers to the Union for Experimenting Colleges and Universities, the official name for the consortium. Perhaps even more interesting, the Union can award graduate degrees that have no other institutional designation. Students in the program can study in several schools and do major portions of their program as work or travel experiences. While the program is a new one, acceptance by students has been excellent. Employer reactions are yet to be evaluated, but no serious problems are anticipated.

D. Neighborhood Center Model

Open education, if it is to be widely accepted and used, must compete with the many other free-time activites which are already available to the post-college adult. Education, with its somewhat uncertain promise of long-term rewards, often becomes the task of tomorrow, losing out to recreation and other activities that offer short-term gratification. To date, highly motivated students have constituted the major constituency of open-university programs. Adult, extension, and continuing-education programs have also been supported in the main by such students.

If open universities are to attract the marginally motivated student, they must reduce or remove those barriers in the educational environment which deter such students from participation. One barrier is cost; but in an affluent society, this barrier tends

to become relative with the costs of competing activities. Since many people devote a significant portion of their income to leisure-time activities, an attractive educational offering should not represent a cost barrier.

Perhaps the most important barrier adults face when considering a voluntary program of education is the problem of easy access. Americans place a high value on convenience and the ideal open university will provide convenient student access. The first two models in this report recognize this need, but have geographical constraints imposed by their association with already established institutions of higher education. The model to be described in this section of the report focuses on easy access, trying to visualize a system that might compete with the local moviehouse and perhaps even with the second or third Sunday afternoon football game on TV.

A truly convenient program would combine administrative, time, and geographical convenience. Administrative actions would include the easing of entrance requirements, registration procedures, residency requirements, prerequisite restrictions, and other rules and regulations which might discourage adult participation. Educational offerings should be made available on a schedule that is student-oriented, rather than administration or faculty-oriented. Early morning, evening and weekend courses are not popular faculty assignments, but these may be the only times many working adults

would be willing to enroll in an open-university program. Geographical convenience is achieved if the educational program can be brought to the student, either in his home, his place of work, or in a facility close to his home or job.

Previous models provided full opportunity to offer administrative convenience. The community college model provided a considerable amount of time flexibility. However, the location of the programs was determined by the site of the schools and their branch campuses. Therefore, the major emphasis incorporated in this model is the improvement of geographical convenience. Geographical convenience is dependent on the nature of the learner access system, so the discussion of this system is of major importance.

1. Learner Access System

Arguments to support the need for analysis of student characteristics and course offerings will not be repeated. However, this model will probably accommodate the widest assortment of student interests and, because of its emphasis on easy access, will attract and hold them.

Before discussing the learning-resource package, the learning environment must be considered. At first thought, since convenience is being stressed, the logical learning environment seems to be a home-learning center; however, further consideration leads to the following reservations.

1) A student working at home is limited to using printed

materials, listening to radio programs, watching TV programs, using the telephone, and, probably listening to audio-tape cassettes. As previously mentioned, radio and TV programs, as they are now delivered to the home, are greatly limited in capacity and introduce major time inflexibility. Many developments, such as video cassettes and potentially low-cost computer terminals, may ultimately be available for home use at a price attractive to the average citizen, but that time is still probably ten to twenty years in the future. Any learning-resource package should be designed with this eventuality in mind, but it would be most undesirable to delay development of the open-education program until such facilities are available in the home.

2) Perhaps even more basic, the home environment is rarely ideal for individual study, and particularly in the case of the employed adult or housewife, the distraction due to the problems of everyday living are often serious deterrents to the successful completion of any study program. Since the target audience for open education is most likely to be adults with family and vocational responsibility, the availability of a learning environment outside the home is probably essential for a successful program.

Therefore, this model will be based on the creation of neighborhood learning centers as the principal interface between the student and a major portion of the learning materials. Keeping in mind the convenience factor, the location of these centers would be chosen to provide access to large numbers of people, preferably within five-to-ten minutes from their homes. To the greatest degree possible, existing facilities would be used and

these could include suitable facilities at four-year universities, community centers, local libraries, store fronts, or any other location.

Some idea of the size and number of centers required for a national program can be realized if certain simplifying assumptions are made. While centers will vary in size, an average-size center should be able to serve about 1,000 students. If these students are to be drawn from an area containing about 36,000 people, about 21,700 would be age 21 or older, and 1,000 of these would represent about 4.6% of the adult population in the area.

The United States may be divided into urban, rural, and sparsely settled regions. About 73% (or 149,000,000 people) are in urban or suburban areas. Another 20% (or 40,000,000) may be classified as rural residents, and the remaining 7% (or 14,000,000) are in the sparsely settled areas. If an average population density for urban areas is taken to be about 1,000 people/square mile, for rural areas, about 50 people/square mile, to provide a learning center for every 36,000 people, the following number of centers would be required:

Urban	4,139
Rural	1,111
Sparsely settled	389
Total	5,639

Since there are already 3500 colleges and 12,000 public libraries, 5600 centers is not an unreasonably large number.

Based on the assumed average population density, the size area which each center must serve to reach 36,000 people is as follows:

Urban Center	36 square miles
Rural Center	720 square miles
Sparsely Settled Center	4800 square miles

Centers in the urban area would meet the criterion of five-to-ten minute access. The 36 square mile area could be represented by a square 6 miles on a side, and if the learning center is located in the geometrical center of the square, the greatest distance from any point in the square to the center would be about 4.5 miles. Thus, if a driver can average 25 miles per hour in the urban area, he could reach the center in about 10 minutes. Those urban areas in which an average of 25 miles/hour is not feasible, usually have a population density much greater than 1,000 people/square mile, and the centers would be much closer together. (For example, New York City has an average density of 26,343 people/square mile).

The rural area would encompass a square about 27 miles on a side, and the longest distance to the center from any point in the area would be about 19 miles. If the average driving speed in such an area is 50 mph, a student would be 23 minutes away if he lived

in the farthest corner. By judicious location of a center, since there is certain to be some clustering of population, probably 50% of the people could reach the center in 10 minutes.

The area of a sparsely settled district would be about 4800 square miles, or a square about 70 miles on a side. Obviously, physical access to a single learning center in such a large area is not convenient or even easily realized. The pattern of lesson delivery being pioneered by the use of a satellite in the Rocky Mountain Project may be the best solution for providing open education to these areas. In any case, supplemental delivery systems will be required if the ratio of one learning center per 36,000 people is maintained in these sparsely settled regions. Nevertheless, even if sparsely settled areas cannot be reached by this model, centers in urban areas and in rural areas could provide 80% of the total population with a learning center that could be reached within 10 minutes.

Neighborhood Learning Centers

The learning-center design may be essentially the same as was described in the community college section of the report. A 40-carrel installation, operating 14 hours per day, 6 days a week, provides 3360 hours of carrel use per week. A total of 47 hours a week could be considered as prime time; namely: 7 a.m. to 9 a.m. and 5 p.m. to 10 p.m. weekdays; 8 a.m. to 8 p.m. on Saturdays. In a center having 40 carrels, 1880 carrel-hours of prime time

could be provided for the postulated 1000-student load, or about 2 hours/week/student. If the center provides study space other than carrels, as it must, a student should be able to schedule a 3-hour study session each week and spend up to 2 hours with a video palyback unit or computer terminal.

Thus, a student load of only 1000 students would allow all students to be accommodated in prime time, a time convenience that would match the geographical convenience of the center. The extra 37 hours per week available at each carrel could be used to attract additional students (in particular, housewives interested in resuming their education, who could come during late morning and early afternoon hours). To accommodate such students, however, day-care facilities for children must be provided. This service can probably be self-supporting in affluent areas, but would represent additional costs in other areas.

If each carrel is used an averge of 2000 hours per week, the costs per student/hour of use developed in the community college section of this report are valid. These were:

Dial Access/Computer System	$1.65/hour
Unswitched TV/Computer System	$1.40/hour

If the center is used 50 weeks a year, a student could earn 20 credits/year, using 100 hours of carrel-time and, depending on which system configuration is available, the charge would be between $140 and $165 or about $8.00/credit hour. Home-study

materials, such as books and special workbooks, may come to an additional $50 per year, but these are costs which have traditionally been extra costs to the student and normally are not included in the tuition charges. If a $22/credit hour charge for interaction with a tutor or instructor were added, the total annual charge to the student would be $30/credit hour. This would also represent the actual cost of providing the instruction. Compared to the $60 to $80/credit hour cost of providing instruction at a traditional college, the difference is a factor of two to three. A charge of about $90 for the equivalent of a three credit course is not excessive if compared with some recreational costs. If a person joins a bowling league, the annual cost will be about $100. A ski weekend can cost $50 plus the investment in equipment.

2. Resource Distribution System

Delivery systems for distribution of video materials to the neighborhood centers would be either broadcast, cable or messenger/mail service.

a. Lowest Level Network Design

The configurations and costs developed in the community college model would be essentially the same for this model. Network nodes would probably be at colleges, although the role of public broadcasting stations and cable head end facilities are still taking form and might offer alternative locations. It is unlikely, however, that any common pattern of networks or network nodes will emerge

since geographical conditions vary so greatly. Adaptation of existing facilities and capabilities should be a primary emphasis, although organizational and administrative complications may restrict the use of other-wise ideal facilities. Telecommunications network links involve an appreciable capital investment, and if capital is not readily available and existing facilities (if any) will not or cannot participate, the delivery system can use messenger or mail service as a start. Then, depending on perceived need, telecommunications links can be added as the various centers grow.

1. Home Delivery Systems

While the only direct home-delivery system considered in this report has been mail service, the increasing availability of cable systems in many parts of the country offers another alternate mode of delivery. Channel limitations may initially restrict its educational use, but all evidence points to substantial increases in channgel capacity in the next few years. If a considerable number of these additional channels can be made available for open-education programs, a new home-delivery system will be possible. There is also evidence in a recent Mitre study[17] that people may be willing to pay a fair price for educational services delivered to the home by cable. The inclusion of cable head end facilities as potential network nodes would allow the networks which may initially connect only neighborhood-learning centers to

evolve into direct home-delivery systems.

Another type of home-delivery system (being proposed by Doctors Piel and Truxal, both of State University of New York at Stony Brook) would use the pages of a daily newspaper. Courses of broad general interest could be published every few days in two or three-page segments and would reach very large audiences. Initial discussions indicate that newspapers are willing to participate and would consider contributing a major portion of the cost. Courses would be generated at the University and readers of the newspaper could make arrangements to receive college credits for the courses. Only one course would run at a time, and probably not more than two courses a year could be offered, but the production and publishing cost for one large newspaper is estimated to be about 50¢ per reader for an entire course. Therefore, the per-lesson cost would compare favorably with the production costs of 1¢ per viewer-hour for the SESAME STREET TV program. The availability of hard copy would be a decided advantage over a TV presentation, particularly for adult students who would want to work at very different rates and to have an opportunity to review the material as frequently as desired. If the courses are successful, they would be easily transferable to other newspapers and thus even larger audiences could be reached.

The role of direct home-delivery systems is still undecided. Educational efforts having wide appeal for special audiences, such

the SESAME STREET TV programs for the pre-schooler, or an environmentally-oriented, adult course presented by newspapers, can probably be justified in terms of cost and educational impact. However, whether the less glamorous, academic and vocational offerings which would make up the bulk of an open-education system are suited to direct home-delivery systems has not been demonstrated effectively, except in the case of highly motivated students. Perhaps greater opportunity for media selection and interaction can ultimately be made available in the home at practical cost but, as previously noted, the nature of many home environments may still constitute a major barrier to broad and effective use of direct home-delivery systems. Certainly, for the immediate future, the neighborhood learning center could be a practical compromise between cost, accessibility of services and learner convenience.

b. Higher Level Networks

The state level education departments would be the most likely agencies to serve as a center of a higher level network. In some states, it might serve as the only network node, but most states are populous and large enough to justify intermediate network nodes. The services and costs provided by these higher level networks would probably be essentially the same as those developed for the community-college model. The associated production capabilities are an important feature of the higher level network nodes, since the high costs of production could conceivably

preclude any extensive efforts at the lower network nodes.

c. Network Management and Financing

The intra-state networks would be managed from the state level. Various leasing arrangements might be necessary to provide access to existing communications links and, in some cases, dedicated channels might have to be built and operated by government agencies. If national or regional networks are developed[18] for accessing national data centers and libraries, connections with that system would be made at the state level for the purposes of these open-education networks.

3. Production, Procurement and Storage System

This model should offer the best opportunity for open production. Students should have the widest possible access to courses, including various versions of each course. To make this possible, and to avoid the deterioration in quality which might attend the production of a braod spectrum of courses, many different production sources could be encouraged to participate. Commercial productions could be given equal consideration with academic and governmental projects. Concepts and suggestions could be solicited from a wide range of possible contributors, and provisions made to reward those individuals who provide useable ideas and materials.

To accomplish these lofty goals, use of these materials must be as unrestricted as possible so that the test of the market can play a key part in selecting specific learning packages. Six

thousand centers, each servicing about 1000 students, would provide a potential audience of 6 million students, or about two-thirds as many students as are now enrolled in all of higher education. If courses could be offered nationwide through this network of learning centers, and if students were free to select any course irrespective of its institutional origin, a major deterrent to the production and use of high quality instructional materials can be removed. Good materials will meet the test of the marketplace and can return adequate rewards to the entire production team.

The prospect that good materials will eventually be rewarded, however, is not a complete answer to the problem of encouraging the initial production of such materials. Marketing risks are familiar hazards for a commercial organization, and their product-diversity and product-development practices are mechanisms that protect against these risks. Production centers associated with schools are quite different, seldom having adequate operating funds and often forced by cost constraints to make compromises in production quality.[19]

To assist academic production centers and to provide incentive for commercial participation, a major support program should be initiated by the federal government. Details of how such a program might operate are discussed in the final section of this report. The support program would serve as a catalyst to start the production and procurement activities, but, insofar as possible, the program

would become financially self-sustaining on the basis of a use tax levied on each learning center each time a course is provided to a student. If this production tax would amount to an average of $10/student/year, or about $10,000/year/learning center (production funding of $36,000 a year was provided in the learning-center budget developed for the community college model), the 6000 centers in this model could generate an annual production fund of as much as $60 million. One thousand courses could be amortized, and a production fund of $40 million would still be available for course up-dating and new production activities.[20] All of these numbers are averages. A particularly good course could easily earn back its production costs in one year and provide its producers with a substantial income for at least five years.

The ultimate evaluation of these materials would be the rate of utilization by students. Many versions of any course would be tested and, over a period of time, the most effective materials would be apparent from student reactions. However, at least two or three versions of the more popular courses would be retained to allow for variations in learning style. Since students could apply for credit and degrees, a statistical study of their success in achieving these credentials would be another measure of the effectiveness of the materials.

4. Credentialling

The greatest problem associated with this model will be

the awarding of credentials to those participants who wish to pursue degree programs. The most likely prospect is that degrees will be available by examination in most states. External degree programs have been instituted already in New York State for some degrees, and extension of the practice is planned. Special regional examining universities, whose sole mission would be granting degrees by examination, are also being considered at the federal level.

A second possibility could be the certification of courses by the school of origin. The legality of this process may be questionable, but it is merely an extension of the practice followed by the correspondence divisions of many colleges and universities. For an extra examination fee, the university which produced the course would provide tests to any center that would request them. Personnel at the center would administer the test to any student desiring credit for the course and transmit the results back to the originating university. If the student passed the test or tests, credit for the course would be awarded. When sufficient credits were obtained, a degree could be awarded by a Union of Learning Centers, similar to the degrees which are now being awarded by the Union of Experimenting Colleges (University Without Walls).

A third mechanism that could be used would be to arrange for nearby colleges and universities to provide tests and award credits. Since perhaps half of the learning centers might be located on a

college campus, such arrangements are conceivable, but they might also impose strong constraints on the students' freedom to choose courses. It would be the least attractive alternative.

Employer Acceptance of Degrees

The public relations aspect of the program must be carefully considered. Over a period of years, employee performance will prove the system, but initially there may be some concern. On the other hand, the recent widespread publicity being given to studies reputedly demonstrating that educational programs have little effect on ultimate job performance may encourage employers to put less weight on the pedigree of a degree.

The fact that a portion of the center courses would be strongly vocational might also encourage employers to consider the center as being oriented toward the realities of the real world of work and therefore cause them to look upon its graduates favorably.

E. Post-Graduate Professional School System

The fourth model to be considered has been fairly well developed at a number of schools, notably: University of Arizona, University of Florida, Southern Methodist University, Stanford University, and Colorado State University. The target audience for most of the programs has been graduate engineers who are interested in updating or furthering their professional education.

A wide variety of courses have been offered, but most of them are required courses in an engineering Master's degree program.

1. Learner Access System

The principal learning package for these courses is a series of TV lectures and a conventional textbook, supplemented by any notes furnished by the professor teaching the course. The students usually view the TV lectures in a special studio at their place of work. The presentation is in real time and may have provision for audio feedback. The GENESYS-type system involves combined cable and microwave networks and can provide an FM talkback link. Details of some configurations are discussed in a recent paper by Martin-Vegue, Morris and Tallmadge.[21]

A closely related system that has used the messenger delivery of video tapes as the dominant delivery mechanism is the SURGE program at Colorado State. The Colorado State system has provided the principal features of the model to be discussed in this section.

Since the largest CSU program uses video tapes, the immediate feedback potential is sacrificed. The importance of feedback capability has been the subject of several contradictory research studies. For large classes, it seems to be of marginal value; for smaller groups, the evidence is inconclusive. Since such real-time feedback is expensive and introduces time inflexibilities, this model will emphasize the video tape used either at the originating school or at the learning site, without provision for instant

response. Thus the CSU cost data can be used to discuss the financial aspects of the system.

While the TV lectures represent the major portion of the learning package, these presentations are usually reinforced by visits of a professor or tutor to the learning site once or twice during the duration of a course. Students are encouraged to visit the campus, if possible, and often tests are administered at the school. Telephone connections with Flexiwriter capability have been used as a substitute for the TV lecture transmissions and an extensive computer network has also been established. However, most experience has been obtained with the video-tape system and that is the only system that is fully costed.

Each quarter, an off-campus group of students receives the loan of 30 one-hour video tapes and two visits by an instructor. The estimated cost for a three-credit course taken off-campus is about $150/student/quarter, where about 4 sections consisting of 3 students each are taking the course. Since a quarter involves 30 hours of instruction, the cost per student/hour would be $5.00.

The high cost per student/hour is the direct consequence of the assumption of an average enrollment of only 12 students per course. To achieve even the $5.00 figure, TV production costs have been reduced to only $32.00 an hour. No allowance is made for preparation time or for teacher time, since the video tape is an un-edited but professional recording of a regular lecture given

by the teacher to on-campus students in a special studio-classroom. Student acceptance of these tapes has been quite satisfactory and the program is healthy and growing.

Learning Resource Centers

The audience addressed by this model has usually viewed the TV lectures in small groups at work or at a school. When the video comes in by microwave or cable, special receiving facilities are necessary and the listening-room becomes a moderately complex technical installation; whereas, when the lessons are delivered by video tape, only a playback unit and monitor are required, and almost any space may be adapted for this purpose. The association of this type of program with a work environment is important and should be encouraged. Moreover, if neighborhood learning centers are set up, the courses should also be available in these centers. If the courses were put on video tape, they would fit into the general pattern of learning-center use, and might increase the audience for any given course.

2. Resource Distribution System

The messenger/mail service is adequate for most applications. Microwave or cable system may be used if the traffic warrants the initial capital investment. If the tapes are used at neighborhood learning centers, most of the cost and networking considerations would apply which were discussed in the third model.

The extension division at University of Illinois, Chicago Circle campus, is using a telephone network to deliver an audio lecture combined with premailed visual materials and, in some cases, a Flexiwriter to draw pictures and diagrams as needed. Experiments have also been planned, using a Picture-phone, but the availability of Picture-phones has been a problem.[22] The telephone network has the advantage of universal coverage and low capital investment; however, the visual presentation potential is limited. If only an audio message is desired, the audio cassette may be a more flexible and less expensive solution, unless immediate feedback is essential. So, once more the value of immediate real-time response to lecture materials must be compared with the lower cost and greater time flexibility of a pre-recorded lesson. For some graduate work, it is very possible that the interaction capability is well worth the extra costs it may introduce.

The increased distribution that could be provided graduate courses by use in neighborhood centers, or with a broad network coverage, may make personal contacts between these students and an experienced teacher difficult to achieve. A similar problem would exist for undergraduate courses, but the supply of competent teachers and tutors is much larger at that level. Some graduate courses are quite specialized and the availability of teaching staff may limit the number of centers or industrial plants which could offer these courses.

3. Production, Procurement and Storage System

In all previous models, the assumption has been made that student enrollments in any course would be large enough to reduce the production cost to less than 50¢/student/hour. These enrollment levels were obtained by postulating numerous learning centers, each of which could offer any one of the courses. In the case of postgraduate prefessional courses, the demand is relatively small and geographically scattered, and, for any one school, the Colorado system is probably the lowest possible cost TV system. However, if courses are to be made available on a national basis, offering the time and geographic flexibility that should be possible in an open-education format, it is unlikely that productions consisting of only the simple classroom recording would be sufficient. First, extra compensation for the lecturer would have to be provided. Next, un-edited tapes might be accepted when students have a chance to visit with the lecturer every four or five weeks, but "talking face" tapes have had a low level of acceptance generally and would probably require extensive editing. The practice of re-doing the tapes for each time the course is given would not be possible, since students might want to start the course any time of the year. So, again, more extensive editing might be desirable. On the other hand, tight editing might reduce the three hours of tape per week to 90 minutes or less, substantially reducing tape and duplication costs.

If these postgraduate courses could be incorporated into learning-center offerings, the additional enrollments would probably compensate for the additional production costs and, for basic courses in popular fields of engineering, the cost might be competitive with any of the other learning-center courses.

The production pattern developed by Dr. Biedenbach at RCA for continuing engineering education would be applicable to preparation of the TV lessons for the postgraduate work. These courses are now being offered for use to other industrial firms and to schools by the RCA Institutes. Similar programs at General Electric, Western Electric, and Xerox have developed a great deal of lesson material which should be tapped if courses are to be made available on a national basis. Another potentially rich source of materials are the many sophisticated training programs developed by the military for their technical personnel. Since the government has already paid for their production, further utilization should be possible at a relatively low cost.

Courses of study for In-Service Training of Teachers (Appendix E), and for a Master's degree in Electrical Engineering (Appendix F) are proposed as two specific courses which could be developed to bring this model into action at the national level. The major source of students in open-university courses have been teachers. They are motivated to continue their studies, have had experience with the correspondence and extension mode of learning,

and can translate their work into financial rewards.

About 40% of all graduate engineers are electrical engineers, so they compromise the largest potential engineering audience for a Master's degree program. Evidence from a study made in New York State (Appendix G) indicates a level of interest in such a program, that, if applied nationwide, could justify the production costs involved.

The key problems in the implementation of a production program for this model would be obtaining access to the already developed materials and identifying sufficiently large target audiences to warrant production efforts any more complex than those used in the Colorado State system.

4. Credentialling System

Since the postgraduate courses would be offered by specific universities, the credentialling is straightforward. If the courses are offered in learning centers in many states, the same problem will arise as in the previous model. Either the originating school must be prepared to provide credit and degrees nationally or a special degree-granting body associated with the centers could provide a special degree. Resolution of this problem is a key requirement for the successful promotion of the learning-center concept.

III. RECOMMENDATIONS

This report is intended to provide decision makers with options rather than a specific course of action. However, several problem areas seem to be common to any proposed version of an open university. Recognizing this, the following program recommendations have been prepared as suggested pallatives for these problems.

1. The widespread interest that has been generated by the open university concept provides a unique opportunity to introduce a new process of education on a large scale. However, before extensive programs are implemented, the potential audience must be better defined. The need for a "market survey" is frequently stressed in this report and the conduct of such a survey or series of surveys is considered most important. Therefore, it is recommended that the NIE encourage state-level surveys [similar to the one conducted by the University of Wisconsin (see Appendix H)], by providing matching funds to any state agency proposing to set up an open university. Further federal funding assistance should be conditional upon a comprehensive survey having been completed.

2. The organizational pattern that is evolving leads to the possibility that each state will set up an "open university" as part of its State University system. These new entities will have strong ties with their sister colleges and universities in the state but will have an independent administrative structure,

reporting to the top eschelon of the state education system. Open universities established as part of a private university or consortia of universities will also have an administrative structure reporting at the Presidential or Chancellor level. To alleviate the usual strong pressures to bring innovative structures back into the traditional mold and to take advantage of the substantial benefits to be derived from cooperative activities between open universities, recognition of the unique nature of these new schools at the State and Federal level is essential. At the State level, an Open Education Board should be established[23] and the establishment of a Federal Council of State Open Education Boards should be encouraged. To provide a federal focus, it is recommended that an Open Education Division in the Bureau of Higher Education, U.S.O.E. should be established.

3. All models of the open university described in this report use technology extensively to provide time and geographical convenience and to allow for individualization of the learning experience. Technology is integral to the process and is essential for providing "openess" and the possibilities of important economies in the process. For a variety of reasons discussed in the report, the concept of learning centers involving extensive technology is central in any implementation plan. Experience with such centers has established patterns of successful use but, in higher education, existing centers tend to be concentrated in a

relatively few showplaces. Therefore, expediting the widespread establishment of such centers is a potential federal role of great importance. A frequently mentioned problem faced in setting up the learning resource centers for an Open University is the unavailability of capital funds for initial procurements and, equally serious, for replacement and updating of equipment and facilities. State fiscal practices often make no provision for such needs.

Realizing the U.S.O.E. need for a legislative mandate to support any new activity, it is recommended that legislation be enacted to establish a federal-loan program whereby capital procurements for learning centers could be financed, and that the proposed Open Education Division of the O.E. be designated as the implementing agency. The capital required to equip an average urban center would be about $300,000. If 1000 centers were created over a five-year span, a total of about $60,000,000 per year of capital funds would be required. Assuming each center would pay back its loan over five years, a loan fund of $180,000,000 would have to be built up over the first five years of operation. After that time, the payback would equal $60,000,000 per year and the fund would become self-sustaining. In addition to financing new centers, the fund should provide loans for expansion or for updating purposes. Since most of the loans would be made to open university operations at the State level, the required legislation should be politically viable.

4. Even if all of the necessary administrative support and physical plans for open universities were to become available in the near future, the availability of high quality learning materials must be insured. Furthermore, such materials must be provided at a reasonable cost. Since the open university involves a different educational process and an independent administration, the usual barriers which exist in conventional higher education to the extensive sharing of curricular materials can be and must be broken down. If these barriers are removed, a free market for curricular production can be created. However, just breaking down barriers to save money would be an empty achievement if the materials to be shared are not of a high quality. One way to encourage high quality production is to reward the producers appropriately. If a producer is given a credit of $0.50 each time one of his videotape lessons is viewed by a registered student, the system costs generated would be consistent with the financial estimates for any of the first three models in this report. The average cost to produce a one hour lesson including one-half hour of video tape is assumed to be $6500, so if each of 1200 centers has two viewers for a given lesson each year for five years, the production costs will be repaid. However, high quality courses would also be popular courses and might easily generate 20 students a year at 1000 centers. The return to the production unit would then be $10,000 a year for each lesson in the course.

So, the marketplace can reward good production but as noted in the discussion of the third model, many potential producers will need some initial funding to allow them to meet high quality standards. There fore, it is recommended that a $5,000,000 annual grant program be established in the National Center for Educational Technology, U.S.O.E. to encourage the production of high quality materials, using ideas from the broadest possible sources and providing funds to some of the many good production facilities available all over the country. The Technology Applications Program (TAP) together with the ERIC program should provide information as to where active production units are located and what has already been produced. Advisory committees, guided by the results of the NIE-supported market surveys, can recommend projects for production and establish specifications. These committees can also review existing materials in proposed project areas and recommend for or against their use. Finally, upon completion, the committees can evaluate the projects that were funded by N.C.E.T. If the O.E. is reluctant to sponsor such committees, it is possible that external agencies such as appropriate learned societies or the National Academies would undertake the task. Further details on a suggested program are contained in Appendix G.

5. Each of the models described in this report is dependent on a telecommunications network. If the Public Telecommunications

Act of 1971 is enacted, the O.E. and most likely the N.C.E.T., will have legislative authority to expand their programs into the non-broadcast area. Linkages between learning centers and higher level production and storage hubs are essential components in several configurations of learning center operation. The high cost of such linkages may deter the development of dedicated systems, in which case the telephone company, the CATV operators or perhaps even the Post Office will be called upon to provide the necessary links and channel capacity at an acceptable cost. In any case, a number of demonstration projects must be funded to evaluate the various possible configurations. Therefore, it is recommended that a program at the $40 million level be established to foster the development of networks at the learning center level, at the regional or State level and at the national level for interconnecting State networks and national data banks. Efforts to enact the legislation required to implement this program should be strongly supported. Once funded, the program would be an extension of the N.C.E.T. activities in Delivery Systems but it is also a logical extension of the Rocky Mountain, Appalachia and Alaska projects. The expertise developed in the HEW Office of Telecommunications on those projects should be fully utilized in any new programs. Development of demonstration projects involving learning center networks in more densely settled rural areas and in suburban and urban areas would be of particular interest.

6. The problem of credentialling open university programs has been a major consideration in each model of this report. The separation of the instructional function and the certification function has much merit and would certainly allow the freest development of the open system. Therefore, it is recommended that the concept of Regional Examining Universities, proposed in the Newman report, be given high priority as a study area by NIE and implementing plans be fully explored. A searching reexamination of the definition of credit and degree, that depends principally on time exposure, is long overdue and should be an integral part of any credentialling study.

7. Development of economically feasible learning materials delivery systems has been slowed by the lack of equipment specifically designed for educational uses. The lack of any significant federal support for hardware development in the educational field has been unfortunate, and has forestalled major cost savings in software. An obvious example is the almost universal use of 35mm slides in study carrels. This small-screen application doesn't begin to use the resolution inherent in a 35mm frame. A Super 8mm frame would be quite adequate and would cost about 1/100 as much to produce. Hardware to make such savings possible is not available, except as a part of more costly and complex devices such as movie projectors. Therefore, it is recommended that a hardware development program be initiated by the N.C.E.T. in the

O.E. Project and project specifications can be developed by staff efforts together with advisory groups. When a performance-type specification is available, quotations could be requested and contracts awarded. Cost-sharing could be incorporated into any contract as a condition for production rights. If the projects were coordinated with the loan program for learning-center capital-equipment acquisition, a potential market for the newly developed equipment could be identified, thereby encouraging prospective bidders to participate. A program of about $3 million per year would spark the interest of many potential contractors both in academic and industrial circles, and should provide highly visible results in a relatively short time.

These seven recommendations are applicable to all four of the models of open universities discussed in this report. They are basic to the successful development of open education in this country and should be seriously considered for implementation. In addition, for each of the four open university models described in the report, specific programs are suggested.

If any of the models are implemented, these ideas should also be considered.

IV. NOTES

Note 1, Page 10

In trying to construct a model, the previously discussed need to identify target populations becomes acutely apparent. A system can be constructed easily with a particular student in mind and the assumption made that the audience will materialize when the system is activated. Unfortunately, higher education has had little experience with the free market and it is easy to ignore the possibility that, given the choice, students might not follow the patterns of traditional instructional offerings. A principal objective of open education is to provide a much freer educational market for the student, both as to instructional methods and as to content. If student preferences are not incorporated into the system, this objective will not be met and, worse yet, student enrollments might not even materialize. On the other hand, surveys will take time, the results may be highly time-dependent, and until everyone has had much more experience with the possibilities and problems of open universities, it may be difficult to define the educational product well enough to obtain reliable market data. Since better product definition can only result from experience, some open universities must be activated. To do so, arbirary assumptions will have to be made concerning target populations. As these models are implements, feedback can be obtained and used to revise the details for the models.

Note 2, Page 10

The choice of printed materials as the basic instructional medium is dictated by the basic nature of open education. To allow for the desired flexibility of scheduling and the freedom for students to proceed at individually different rates of progress, the student will do much of his learning by himself at home. With the possible exception of a television receiver, there are no other devices found in most homes that could be used with non print media. Although the proponents of cable TV predict great changes in the future, as of 1972, 90% of all TV households are still dependent upon broadcast signals to obtain TV programs. Few areas have more than one TV channel devoted to educational or public broadcasting, and these stations usually confine their instructional programming to daytime hours and in support of elementary schools. To provide all the basic learning resources for an open university by TV programming would require the sacrifice of the scheduling flexibility and the freedom for individuals to progress at widely differing rates that are essential features of open education.

Note 3, Page 10

Perhaps the closest competitor to the printed package is prerecorded audio tape. The commercial introduction and standardization of the cassette format has led to its rapid acceptance and wide-spread use. The number of households having cassette recorder/players is estimated now to be already in the millions and

in the near future, these low-cost devices ($20 to $60) will become a sufficiently common household device to warrant the design of at least some of the open university instructional materials on cassettes. The British Open University has already added cassettes to some of their lessons and most open schools in the United States are planning to use audio tapes as part of their instructional resource package.

The present low cost of using cassettes can be further reduced if the tapes are erased and rerecorded. Since this process can be repeated 10 to 20 times, the most significant cost becomes the differential cost of rerecording, which can be as low as $.25 for a 90-minute cassette. If the recording is principally speech, and the speech has been accelerated, the tape will deliver about 300 words per minute or a total of 27,000 words. Since the average page of printed material contains about 350 words, the 90-minute tape cassette would be equivalent to about 75 printed pages. Thus an equivalent cost per page would be one-third of a cent, a cost that compares well with the price of printed copy.

Unlike TV, the audio tapes offer the same time flexibility that the printed page offers. The student can stop at any point or go over any part as often as desired. True, recorded sound cannot be scanned nor can it be randomly accessed quickly; however, instructional audio tapes should always have an accompanying workbook to provide pertinent illustrations and an outline of the

recorded material. This outline can then be used to scan the audio material and to assist the listener in locating any particular portion of the message.

Note 4, Page 11

A number of schools, such as the Oakland Community College in Bloomfield, Michigan, are experienced in promoting individual study patterns and already have many of the necessary facilities that would be required to support an open education program. In other schools, the libraries or some particular department have started to build study carrels and to accumulate non-print media. However, there are also some schools that have neither the experience nor the facilities. A major effort would be required to institute an open education program in these schools. If this model is implemented by a demonstration program, it would be preferable that the schools selected have at least some experience with this type of education.

Note 5, Page 13

Since any audio material could be given to the student on a cassette and cassette players could be put in each carrel, it will be assumed that the system will be used only for video transmissions. A total of 3600 one-half hour TV programs would satisfy the requirements for all 300 courses. One-half hour of tape in the ½ inch format costs about $12.50 making the initial investment cost in unrecorded tape $45,000. Tape life is about 100 plays.

With 3600 tapes to provide 64,000 hours of instruction, a tape will receive an average of 18 plays per year. Therefore, the tapes can be amortized over a 5-year period.

Note 6, Page 13

Operating personnel would include a part-time maintenance engineer, supervisory staff to schedule the use and monitor the performance of the facility, and staff to change tapes and maintain the stock in order.

Note 7, Page 13

Each non-computer lesson will consist, on the average, of a one half hour video tape and a package of associated prints and audio materials for carrel use and for home use. The production cost for the tape is assumed to be $5000 and the remainder of the lesson will add another $1500, bringing the total cost of a lesson to $6500. Since each learning center will offer 3600 lessons, for this model the total production cost for all lessons would be $23,400,000. If learning centers are set up in a majority of the 1000 two year colleges in the U.S., and if 130 of these centers use any given course, the initial production cost would be $180,000 per center. If each lesson is redone on the average of once every five years, the cost per year per learning center would be $36,000.

An initial investment of $23,400,000 would be required. A federal program that could assist in raising these funds is

discussed in the Recommendations section and in Appendix G of this report.

Note 8, Page 14

Estimates for computer software varies almost as widely as for TV programming. Used in the simple computational mode, the cost of lesson design for one hour's use may be $100 or less. Used in the full instructional mode, costs from $2,000 an hour to $10,000 an hour have been reported. An average cost of $1,000 an hour will be used for this calculation. Since 900 one-hour lessons are required, the production cost will be $900,000. If the programs are shared with at least 100 schools and can be used for 3 years, the cost per school would be $3,000.

Note 9, Page 14

Three different cassette configurations will soon be commercially available. The playback equipment design for each type is capable of reproducing color video signals. The playback-only units will sell for about $1,000 and a color monitor for an additional $500. The market is in the early stages of development although the technology of magnetic tape video players is well-advanced and the only feature that has been added is the packaging of the tape into the convenient-to-handle cassette format.

Note 10, Page 17

Two new video recording technologies are being developed. The most developed version uses "hill and dale" recording and

and a piezoelectric pickup from a plastic disc. Demonstration units have shown excellent color TV pictures from six-inch diameter discs rotating at 1800 revolutions per minute. Without a monitor, the playback units are expected to cost about $400. The plastic discs would only cost $2.00 to $3.00 an hour, unrecorded. Local recording would not be possible but duplication in a central stamping facility would be easier and cheaper than duplication of magnetic tapes. A second version was recently announced that uses a laser beam for a pickup and can provide up to 45 minutes of uninterrupted video on one side of a 12-inch disc. Costs for discs and equipment are expected to be about the same as for the first version.

A third video recording technology uses plastic tape upon which are imprinted holographic images generated by two laser beams. This development is in an earlier stage than the plastic disc but also offers the potential for low cost playback units and tape costs of about $0.50 per hour. The three-dimensional nature of holographic images would introduce an additional feature that might be useful in presenting certain educational materials such as a course in solid geometry.

A similar situation exists in computer terminals and in computers themselves. Terminals with graphic display capabilities are becoming increasingly versatile and more competitive in cost with the simple teletype terminals. Specially designed teaching

terminals such as the units used in the U. of Illinois PLATO IV system are expected to sell in quantity for less than $2,000. With such a terminal available, much of the video materials might be transferred to the computer system and the number of carrels equipped with video players compared to the number equipped with computer terminals may be very different than the four-to-one ratio used in these models.

Another development that could have an important impact on the choice of equipment in the near future is the work of the Mitre Corp. and their TICCIT system. Using a modified TV display fed from a computer controlled source, a "frame grabber" feature could send a different video picture every three seconds to each of 180 receivers. The potential impact of this development will be discussed in the section on distribution systems.

So, if the equipment in a learning center is leased for the first five years, the facility could be converted to the most effective technology at the end of that time and the lease-buy decision could then be reviewed in light of the current state-of-the-art and progress toward standardization.

Note 11, Page 19

With 1500 TV lessons to provide 38,000 hours of instruction, the lessons would be used on the average of 25 times per year. Since tape life is 100 plays, the tapes must be amortized in 4 years.

Note 12, Page 33

It is estimated that the labor required to play and change tapes for the four channel transmitter would cost about $4.50 per hour. Since the station would be broadcasting 23 hours a day, 6 days a week, 50 weeks a year, the tape playing charge would be about $32,000. Transmitter labor costs would be about $0.50 an hour since the transmitters would be under automatic control most of the time. These costs would be about $2,500 per year, making the total $34,500. Space requirements, amortized over 40 years, would be about $2,000 per year. If this new total of $36,500 is divided between the 10 learning centers, the annual charge would be about $3,650.

Note 13, Page 34

The detail of the learning center capital costs for equipment would be as follows:

	Annual Cost
10 Receivers @ $13,000, amortized over 5 years	$ 2,600
10 Converters @ $2,500, amortized over 5 years	$ 500
10 Video recorders @ $15,000, amortized over 3 years	$ 5,000
32 Video players @ $32,000, amortized over 3 years	$10,666

	Annual Cost
32 Carrels @ $16,000, amortized over 10 years	$ 1,600
42 Color TV monitors @ $21,000, amortized over 5 years	$ 4,200
	$24,566

Note 14, Page 35

It is likely that only a fraction of the tapes would have to be rerecorded in any given week and that the recording task could then be accomplished with fewer than 10 recorders. Unless the recording was being done automatically, this would also mean a reduction in the amount of labor needed to man the recording activity.

Note 15, Page 35

Operating costs of the learning center would include the following:

	Annual Cost
Space (50 sq. ft./student @ $2.80 sq. ft./yr.)	$ 4,480
Maintenance	$ 9,500
Supervision & other personnel	$19,500
	$33,480

Note 16, Page 40

Data on annual expenditures per FTE student in public

institutions ranges from $1,000 to $2,100. Private institutions range from $1,300 to $2,800 per year. An excellent summary of these costs is found in the Carnegie Commission Higher Education report "The More Effective Use of Resources" on pp. 38 and 39 (June 1972).

Note 17, Page 67

URBAN CABLE SYSTEM, The Mitre Corp., M72-57: May 1972.

Note 18, Page 70

A major portion of an NAE study on issues and policy in educational technology which is being carried out for the U.S. Office of Education will address itself to various possible designs of national networks, including extensive cost data. The report should be available soon after January 1, 1973.

Note 19, Page 71

There are notable exceptions to this situation, one being the Instructional TV center at the University of Indiana which is pioneering the practice of pooling the resources of ten or more schools to obtain sufficient funds for the production of a given series of high quality programs for which each school has a need. The finished programs may then be used by the participating schools and sold to other schools.

Note 20, Page 72

If course-production costs are, on the average, $100,000 per course, and if a course can be amortized over five years,

the cost per year would be $20,000. To amortize 1,000 courses, the annual cost would be $20 million, and if $60 million is collected each year, $40 million would be available for the cost of administrating the fund, the costs associated with selecting production projects, and the cost of grants to underwrite the actual production activities. About $20 million per year would be provided to update existing courses and funds for the production if an additional 100 new courses should be available.

Note 21, Page 75

TECHNICAL AND ECONOMIC FACTORS IN UNIVERSITY INSTRUCTIONAL SYSTEMS, C.A. Martin-Vegue, A.J. Morris, J.M. Rosenberg and A.E. Tallmadge, Proc. of the IEEE, June 1971, Vol. 59, No. 6, P. 946.

Note 22, Page 78

Paper in publication - Fall issue Journal on Educational Technology Systems, Vol. 1, No. 2.

Note 23, Page 83

See A FORWARD LOOK - a report of the Governor's Commission on Education, State of Wisconsin, November 1970.

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Part 2

APPENDICES

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OPEN UNIVERSITIES IN THE UNITED STATES

FOUR MODELS AND RECOMMENDATIONS

October 1972

APPENDIX A

BRITISH OPEN UNIVERSITY

Starting Dates

The concept of the British Open University was generated in 1963; the school officially opened May 1969. The first students started in January 1970.

Facilities

The University has a headquarters complex in N. Buckinghamshire, mans twelve regional centers with full-time staff, and provides about 284 student centers where three types of part-time tutors may work with students in the surrounding area.

Purpose

The principal object of the University was defined by its first Chancellor, Lord Crowther, as follows:

> "The first and most useful task before us is to cater for the many thousands of people fully capable of a higher education who, for one reason or another, do not get it. ----The existing system, for all its expansion, misses and leaves aside a great unused reservoir of human talent and potential. To them we offer a further opportunity. But ---- this is not simply an educational rescue mission - though that is our first task and we do not decry it. We also aim higher and wider. Wherever there is an unprovided need for education, supplementing the existing provision, there is our constituency."

Admission Requirements

While, in principle, the University is open to anyone, there are several important criteria that a student must meet before

being accepted. Students must be over 21 years of age and be residents of the United Kingdom. They must be properly prepared for college-level work and a need must exist for improved education standards in the student's occupational group. Finally, availability of adequate tutorial help at a nearby study center is also considered. For students meeting these criteria, selection is on a first-come/first-served basis. The emphasis on proper preparation, while not rigorously applied, could be a major barrier to many people and does limit the "openness" of the educational opportunity.

Students

About 25,000 students were accepted in the first year of operation. About 70% were male; the average age was 27. Approximately 37% of the students were teachers; some 3,000 came from the professions; and only a small percentage were from blue-collar classes. The class entering in January 1971 showed a better balance between the number of working-class students and those from white-collar families.

Course of Study

Five foundation courses have been developed. There are courses in the Arts, Mathematics, Science, Social Science, and Technology. Most students take one course a year. Each course is divided into 36 units and each unit is considered to be one week's work. Over the summer, each student is expected to attend a one-week tutorial

session at a selected school or university. The school year starts in January and is 42 weeks including some holiday time during the summer.

Evaluation Practices

Each unit contains a self-evaluation unit which a student can use for self-testing. There are also unit tests or assignments which are sent to the Open University. Some are computer-graded, others are graded by the tutors at the local study center. The University has a final examination period at the end of the 36-unit course; the final examination grade is a major evaluation tool.

Certification

Two degrees are now being offered, a B.A. and a B.A. with Honors. The requirement for a B.A. is the completion of two foundation courses and four upper-level courses. The Honors degree would require the completion of two additional upper-level courses. A B.A. course would require six years to complete; an Honors degree, eight years; although a student may take two courses some years if he has time, funds, and motivation, and thus reduce the time required for the degree.

Learning Resources

The unit lessons are grouped, four units to the package, and a package is sent to the student every four weeks. The unit lessons contain printed exposition, illustrated as required; self-assessment exercises and unit-test assignments; notes about the

related TV and radio programs, audio cassettes or other AV materials; and, often, special glossaries. For the science and technology foundation courses,kits of equipment and experimental materials have been developed and are made available to the students on a returnable-deposit basis.

In addition to the correspondence materials, each foundation course involves the use of set books and books recommended for background reading. Students are expected to buy the set books, and reference books should be available in the local library.

Associated with each unit in the foundation courses is a half-hour TV show broadcast twice weekly by BBC and a 20-to-25 minute radio program on BBC, also repeated once during the week. In addition, 15-minute programs of general interest are broadcast weekly on radio, and monthly on TV.

An early name associated with the Open University was the "University of the Air." It is interesting to note that the realities of programming costs and time restrictions have reduced the telecommunications component of their learning resources to two half hour/courses/week.

A vital resource to each student is a class tutor at a study center. In addition to the assistance of the tutor, the study center provides access to reference materials and lab devices. Over 100 of the centers have also been provided with computer terminals. Students enrolled in the mathematics foundation course may have

access to a terminal up to ½ hour every two weeks.

Finally, the summer session is an essential resource, particularly for the science students. Access to sophisticated laboratory equipment is made possible and additional personal contact with the instructional staff at this half-way point in the course is often valuable.

Sources of Courses

All courses have been developed by the academic staff and are specially designed for the Open University objectives. They tend to be interdisciplinary in nature, the result of teams of content specialists working together. About 30 specialists in educational technology have been involved in the planning and execution of all of the courses and are an integral part of the instructional staff. For example, the team that developed the foundation course in science consisted of about a dozen members of the science faculty, two senior BBC producers, an editor, and educational technologist and some consultants. The written materials for the 36 science units are the equivalent of five 300-page textbooks. In addition, an ingenious home-experiment kit and plans for 30 experiments were prepared, 36 TV and radio shows recorded, and other supplementary materials were designed. Almost all of this course development was done over a 15-month period, but only by working 70-hour weeks on a routine basis.

An attempt is made to accommodate the differences in student

abilities by providing more than one "channel". In the Science courses, two supplementary channels are provided; one for students needing remedial or further explanatory materials; the other for students wanting to supplement the material in depth.

Costs

The capital investment used to set up the Open University project is expected to be about $12 million. Operating costs during the first full year of operation approximated $15.5 million. This could be divided into about $4.5 million for BBC, another $4.5 million for the headquarters operation, and about $6.5 million for costs associated with student instruction. Estimated student fees are about $2 million, so the net cost of operation is about $13.5 million, or between $500 and $600 per student.

Student fees to the Open University are between $80 and $105 depending on the course selected. In addition, set books must be purchased, and the cost of travel to the summer session included. As higher level courses become available, the fees will be about double the fees for the foundation courses.

Staff

A full-time faculty of 200 provides a pupil/teacher ratio of 125 in the conventional sense. However, the staff of 3,000 tutors provides a ratio of student/tutor of 8, which explains the individualization of instruction which has been possible in spite of the predominantly correspondence nature of the instruction. It

is true that most tutors are not full time, devoting about twenty hours a week to the task. However, since each study center has an average of about twelve tutors, this means about 240 tutor/hours a week are available. If the pupils were evenly distributed geographically, there would be about 100 students per study center. Therefore, about 2.5 hours of tutoring per week would be available to each student, which is quite a sizeable amount of time.

APPENDIX B

U.S. OPEN UNIVERSITIES

I. Two-Year College Programs

1. Chicago City Junior College

The most frequently noted 2-year college program is the Chicago TV college.

Mission:

To teach conventional college courses for credit using a single channel TV broadcast.

Admission Policies:

Same as for classroom attendance at the Chicago City Junior College.

Credentialling:

Receive same credit and degrees as other Chicago City Junior College students.

Student Characteristics:

Average age 29 yrs., 75% women. Intelligent, highly motivated, ambitious, serious and career-conscious. Average IQ - 110-120. Almost half are preparing for teaching careers. One half are non-credit enrollers.

Scope of Service to Learners:

Principally, standard liberal arts and sciences, two-year curriculum. Some adult education courses are planned.

Broadcasts confined to Chicago area but video tapes are available from the Great Plains National Instruction Library and students outside the Chicago area can register ($25), rent the tapes, and receive credit for courses if they can pass the course examinations.

Student-Faculty Communication:

Four contacts. (1) By mail-correct homework and exams. (2) Telephone contact right after a TV program. (3) Conferences with teachers in branch school nearest student's home. (4) Lab sessions and some small group meetings.

Costs:

Annual budget is about $1,000,000/yr. all provided by the Chicago Board of Education. Station costs are 1/3 of total budget.

Comments:

The open feature of this educational experiment is the lack of required attendance at the school and the geographic freedom provided by the TV transmissions. In all other ways, the system is tied closely to parent college.

2. MITRE CAI Program

An innovative program that focusses on CAI has broad implications as a prototype for the community college model of

the open university.

A 128-student console CAI package will be installed in each of two different community colleges by the Mitre Corp. as a part of their TICCIT project.

The project has just started so many of the details are still in the planning phases. The system is based on the MITRE TICCIT CAI system and proposes to use the "frame grabber" to service 128 terminals over a single 10 Mc band width channel. Instructional materials will be provided by Texas University and Brigham Young University. Subjects covered will be one year of English, Mathematics, and Computer Science. Students will use CAI in over 25% of their classroom contact hours.

While the project is built around a "classrom" concept, the console capacity would be more than adequate for a learning center as visualized in the community college model and, if one accepts the suitability of using only still pictures, the single channel capability would open up the chance to use commercial CATV systems.

3. Other Jr. and Community Colleges

Three schools active in external degree programs are:

1. Miami Dade Junior College, Miami, Fla.
2. Vermont Regional Community College, Montpelier, Vt.
3. Whatcan Community College, Ferndale, Wash.

II. Four-Year Colleges and University Programs

Open University programs associated with at least fourteen state university systems and several private colleges are mentioned in the literature.

1. Empire State College

One of the first schools in the U.S. to apply an open education philosophy to post-secondary education.

Mission:

"Empire State College was created by the Board of Trustees of State University of New York in response to the urgent need to provide new and more flexible approaches to education in New York State."

Admission Policies:

Specific criteria for admission are not indicated but the need for an equivalent of a high school diploma is implied. Qualifications are evaluated by the Director of Admissions. Admission depends upon geographical location of the student and limitations on the number of students who may be served at any given time. Credit for prior learning gained from job, travel, community activites, etc. can be awarded after acceptance but such learning is not obviously applicable, as a substitute for formal high school courses. Admission is on a year round basis but fees are charged on a quarter basis.

Credentialling:

Two degrees are offered, an Associate of Arts and a Bachelor of Arts degree. The expectation seems to be that all students will be working toward one of these degrees. The degrees will be awarded by the Board of Trustees, State University of New York.

Student Characteristics:

Largely unknown to date, since enrollments have just started. Students enrolled so far are mostly between the ages of 28 and 45. About one third are between 19 and 28.

Scope of Service to Learners:

Six categories of learning categories:

1. Formal courses in colleges and other organizations other than Empire State.

2. Cooperative studies which arise when several students share a similar interest.

3. Tutorials in which a teacher helps a student pursue a particular area of knowledge or competence.

4. Organized programs of self study with individualized learning resources.

5. Direct experiences, travel, field work, volunteer activities, etc. that become the object of examination and reflection by the student.

6. Independent studies that call for a series of readings and writings.

All learning is organized around Contracts and Programs of Study which include several contracts. Students work out contracts with their mentor, a faculty advisor.

Use of Technology and Media:

Eventually eight learning Service Centers will be built. The College has both its own learning resources and acts as a broker for other resources. Each center will have 400 students (FTE), 3 administrators and 13 faculty members.

Student-Faculty Communication:

Every student is assigned a mentor who is expected to help clarify purposes, develop a general conceptual framework for program planning, make specific plans for study and evaluate progress. Students will call on mentors for whatever assistance they require in developing sound programs. Students are encouraged to meet faculty in small group discussions, to gain apprenticeship experience outside the formal school structure. Students will be working with individual tutors as content experts at different times during the program.

Costs:

Tuition will be about $900 a year for four quarters of study. Another $300 is needed for books, supplies, seminars and workshops. Some financial aid can be made available.

2. University Without Walls

Mission:

A joint effort by 21 colleges in the Union for Experimenting Colleges and Universities based at Antioch College. Individualized courses are offered to about 3,500 students - aged 17 to 76. Continuous dialog with an advisor chosen by the learner is made available. A broad range of learning resources are used, including jobs, travel, and conversation with people in the community who have special knowledge or skills. Time units are flexible. The student's work is evaluated jointly with advisors, adjunct professors and perhaps other students and the control of his program is shared by the student, the administrators and the faculty members. Goal is to develop skills for self-directed and independent learning.

Use of Technology and the Media:

All available learning resources can be used but there is no special program to generate new materials.

Credentialling:

Participating colleges award a Union-UWW, their conventional degree. The time schedule for completing the undergraduate education is quite flexible.

Scope of Services to Learner:

The student is provided with an individualized program with instruction by regular and adjunct faculty as well as members of the community. All facilities of the participating institutions are used.

Relations With Other Agencies:

Twenty schools are cooperating in the program. Programs with community include efforts at prisons, for invalids and for students outside the U.S.

Admissions:

A high school diploma or equivalent is required for admission. Credit for "life experiences" is often granted to provide advanced standing for adult students.

Funding and Costs:

Original funding from O.E. and later from Ford Foundation. Tuition rates paid by UWW students are those of the college in which they enroll. These rates vary from $300 to $3400 a year. The average cost is between $1500 and $2500 a year.

Start-Up Dates:

Program started in 1971 with 120 students and 4 faculty.

Participating Schools:

University of Minnesota; University of Massachusetts; Antioch College, Ohio; Bard College, New York; Chicago State University; Goddard College, Vermont; Howard University, Washington, D.C.; Skidmore College, New York; New York University; Friends World College, New York; Loretto Heights College, Colorado; Morgan State College, Maryland; New College, Florida; Northeastern Illinois State University; Roger Williams College, Rhode Island; Shaw University, North Carolina; University of South Carolina; Staten Island Community College, New York; Stephens College, Missouri; Westminster College, Missouri; and Westminster College branch at Berkeley, California.

3. The Wisconsin Open Education System

Mission:

The "Open School" is intended to supply opportunity to those whom the regular schools do not reach. It would have a higher education unit. Each student will be encouraged to progress as far as his talents and motivation permit him.

Admissions:

No formal academic qualifications will be required for entry into the Open School. A structure of local advisors, counselors and community volunteers will aid in directing students into programs. Means will be employed by the Open School to determine initially fairly accurately student readiness for learning at each level of instruction.

Educational Rewards:

Since the Wisconsin Open School is linked to all other educational institutions, the first step is to request the regular institutions to grant the diplomas, degrees and certificates needed. Second, if the regular institutions cannot or will not supply the needed rewards, the Open School would be authorized to do so.

Linkage With Other Agencies:

The Open School will take advantage of all the state's institutional and private resources by providing a central laboratory for cooperative research and development and by providing a vehicle for coordinated extensions of new techniques to new audiences. Program inputs will be made available to the Open School from all existing state and private educational institutions, from Wisconsin Library Association approved libraries, from selected museums, civic centers, from Regional

Materials Centers, from all other established agencies on a contractual basis.

Scope of Service:

Statistical extrapolations from a sampling poll indicated a potential clientele of about 800,000 adults of a total state population of 4.5 million. This is more indicative of aspirations than hard enrollments but even 10% of that number would be a large audience.

Use of Media and Technology:

Each course is to be uniquely structured for study by a wide variety of methods. The methods for studying a course will include, but not be limited to, the following: live lecture, individual tutoring, demonstration, educational games and simulations, programmed workbooks, CAI, AV teaching machines, audio tapes, ITV, work projects, transparencies, motion pictures and single concept films, direct manipulation laboratories, verbal laboratories, homework exercises, filmstrips, seminars, and reference textbooks. Telephone and mail will be used heavily, together with the Educational Telephone Network, FM subcarrier channels (SCA), 2500 MHz broadcasting when the message must go to a large number of persons scattered over wide areas.

Costs and Funding:

For post high school courses, student fees shall not be more than 25% of instructional costs. Some adult programs will be completely subsidized.

Primary funding for the Open School is proposed to come from state funds, probably as a percentage of the total state aid to education. Secondary funding would be from federal sources, from business and industry and from student fees.

Operational Target Dates:

In 1972, legislature is being asked to fund, at $100,000, a one-year demonstration and development activity, leading to a major proposal in 1973.

4. State University of Nebraska

Mission:

Without requiring extended periods of residence on established campuses, a program appropriate to two facets of the mission of a university: transmitting knowledge and skills to desirous students, and serving the educational needs of citizens to whom the school is responsible by providing much more opportunity for drop-in and drop-out types of students.

Admissions:

A high school diploma or its equivalent would be

required although some provision may be made for enrollment by high school students with advanced standing.

Provision of Educational Awards:

Credit will be given for educational experience gained through self-study, employment, the military, and in-service education which might parallel traditional courses. Also, credit will be given for activities such as the various kinds of technological, management or administrative understandings and skills which individuals have learned through a variety of means but which are, nevertheless, academic in nature and which would warrant the giving of credit based on satisfactory performance.

Instruction will lead to certificates, an associate degree or the more traditional bachelors and advanced degrees.

Linkages With Other Institutions:

The University will be designed to work in harmony with and supplement the efforts of existing educational institutions and agencies. Regional centers will be located at host or participating universities, including public libraries. Working with the regional center counselor, central staff members would try to make special arrangements in the neighborhood of each student to enable him to secure additional instructional help as he wishes.

Scope of Service:

Potential clientele would be 255,000 (age 21-34) and 310,000 (age 31-52). By use of nine ETV stations, students all over Nebraska and many neighboring states could also participate.

Use of Technology and Media:

Each course would be made of the following: A learning kit consisting of a predetermined study course, a student guide amply illustrated with diagrams and pictures, and a reading list. A series of 29 minutes color telecasts. A companion series of audio instructional units of varying length, correspondence with course tutor and professor, telephone consultation, periodic meetings with the course professor, student counseling, lesson review and examinations.

Costs and Funding:

Students will pay standard tuition fees. Program is being funded by O.E. at about $400,000 in 1973 and $800,000 in 1974. Total operating costs after start-up are projected to be about $700,000 a year. About 2500 full-time students would be needed to make the program self-supporting.

Operational Date:

Start-up in 1972, working up to full operation in about three years.

5. Minnesota Metropolitan State College

Mission:

An institution that will devote itself to transfer students from metropolitan junior colleges and area vocational-technical schools and other adults who need upper division educational opportunities to complete degrees.

Admissions:

Administratively the college will place responsibility for admission, competency assessment and advising under a coordinator and a staff of professionals. Student competencies will be assessed in five basic fields and in subsidiary fields.

Educational Rewards:

Students will be awarded degrees on the basis of demonstrated competence and not on the basis of credit hours accumulated or courses taken. Each student will design his own educational goals and enter into a contract. Degrees will be awarded by the Minnesota Metropolitan State College as Bachelor of Arts in either urban liberal studies or urban-oriented professional or para-professional fields. Related Master of Arts degrees will be awarded at a later date.

Linkage With Other Agencies:

For classrooms and laboratories, the College will utlize space in such facilities as the St. Paul Arts, the Minneapolis Auditorium, the St. Paul Civic Center, the state capitol complex, public schools, churches, junior colleges and private colleges and universities. The College will also use specialized facilities of private industry and government agencies. Close cooperation is expected with all State colleges and universities, local business and labor organizations, community and government agencies and interested individuals.

Scope of Service:

A target population of 800,000 over age 25 is available. About 720,000 of these people do not have a college degree.

Use of Technology and Media:

No special program in technology is planned, but all technologies will be used wherever appropriate.

Costs and Funding:

Start-up funds from the State legislature were $300,000 for 1971. Students will be charged about $700 ($7.25/credit hour for 96 credit hours) to be paid over an 18-month period to cover two years of instruction. If only one year is needed, the cost to the student will

be $350, but that will also be the minimum charge.

Operational Target Date:

Pilot program with 200 students began in January-February 1972. Full operations are planned for 1973.

6. University of the Commonwealth (Massachusetts)

Mission:

A non-residential institution, that will recruit a diverse student body, ranging from teens on up. The focus will be on what each student knows and can do when he leaves rather than on previous training or credentials. A major portion of his program will include work experience in jobs related to his career interest. To make higher education more productive, an integrated multi-media approach will be used, thereby substantially reducing cost per student compared to new residential universities.

Admission:

Enrollent criteria will be very personal and flexible. An applicant might be asked for a sponsor, someone who can recommend him for higher education. The prospective student would visit the Regional Study Center and talk with staff and other students. No test scores or other credentials would be required. Enrollment could be full time or part time.

Educational Rewards:

The University would award both undergraduate and graduate degrees. During his enrollent, each student would assemble a portfolio of his accomplishments in course work and other experiences. A Degree Committee would be formed to pass on the quality of the work in the portfolios. Field examinations would be given the student in all major fields studied and satisfactory performance must be attained. Time to earn the degree will vary for each student.

Linkages With Other Agencies:

The University would draw heavily on all educational institutions in the Commonwealth of Massachusetts. Also, industry and government would be involved extensively in the work experience programs.

Scope of Service:

Students will include those of regular college age as well as older "second chance" pupils. All economic groups and all geographical areas of Massachusetts would be served.

Use of Technology and Media:

As a non-residential university characterized by individual, self-paced learning, the University would employ educational media and technology to a greater

degree than most colleges. Appropriate combinations of TV, tapes, film, programmed learning kits and other technological innovations will be used in all courses, but subject to availability and cost.

Costs and Funding:

A start-up grant of $300,000 to $500,000 has been requested from the legislature for a first year effort. Cost per student per year is estimated at about $700 for mentor, tutor, evaluation and adjunct faculty. Costs for course development may cost $200 more per student per year.

Operational Target Date:

Start-up would be 1972 if funded. A four-year period would be required to bring the University into full operation, but some students might start in January-February 1974.

7. Other U.S. Four-Year College Programs

California State College System

An external degree program is being developed. Chico State is offering courses that enable students in nearby towns to earn bachelor's degrees without attending classes at the college. Chico State faculty will teach the necessary courses at local junior colleges. At San Francisco State, freshmen are using CLEP exams to

eliminate the need for any first year courses or can get credit for specific courses if they pass the exam for that course.

California Extended University

A report by a President's Task Force proposes an open university for the University of California. The school would provide improved opportunities for part-time study applicable to degree awards. Upper division level and masters level programs would be the only programs offered. Admissions would be liberalized and some new curricula would be developed but, initially, the emphasis is evolution from existing programs. Existing campus facilities would be fully available, learning centers would be established off-campus and learning resources such as libraries and laboratories would be augmented and made available to part-time students. Regular faculty would be expected to man the programs, although substantial use of independent study is also envisaged.

Organizationally, a New College is proposed, consisting of a college or division on each campus and these would become a university-wide consortium. In addition, Learning Centers may be added if geographically necessary. New College would be administered by a Provost

and responsible to the Chancellor. A pilot program was to start in fall of 1972.

A "Video University" has been proposed by A.M. Mood at the University of California, Irvine campus, which uses video cassettes extensively. Students would attend college full time only one year, with additional higher education as a part-time activity extending over one's lifetime. Serious funding for the program has not become available as yet.

Syracuse Research Corp. Consortia

The Ford Foundation awarded a grant to the Policy Institute to design an External Studies Program in the 5-county area of Central New York. The program is still in the planning phase but will be seeking support from O.E. for a four-year pilot program.

Other State University Systems

Discussions, studies and proposals are underway in a number of state university systems. Programs, often based on extension divisions and/or state ITV networks, mentioned in the literature are the following:

(1) New Jersey (Edison College)

(2) Connecticut

(3) Illinois

(4) Maine

(5) Maryland

(6) Oklahoma -

Two programs, one involving their Talkback TV Network, the other in the College of Liberal Studies

(7) Florida -

The principal program, now in existence, is at the University of South Florida

(8) Hawaii

(9) Texas

Other Four-Year Schools

Programs having many of the elements of an open university are offered by the following schools:

(1) Syracuse University - University College

An external degree program offering an A.B. in Liberal Studies or a B.S. in Business Administration

(2) Milwaukee Area Technical College

(3) New York Institute of Technology

Special Post Graduate Professional Programs

Five schools offer graduate programs, mostly in engineering, for off-campus students, usually using video tapes or TV broadcasts or a combination of the two. The schools are:

(1) University of Florida

(2) Southern Methodist University

(3) Colorado State University

(4) Stanford University

(5) University of Arizona

III. Non-Campus Programs

British Open University Extensions

Several efforts are underway to bring British Open University programs to the U.S. The British are anxious to sell their materials in the U.S. to give them a broader base of support.

A. North American Open University-Open University of North America

Incorporated in Florida but operating in Boston, the school would act principally as a broker for materials, selling to established colleges and universities. The radio and TV programs are available but no mechanism to use them effectively has been devised.

B. The Educational Testing Service, supported by the Carnegie Corp. proposes that four U.S. universities, Rutgers, University of Houston, University of Maryland and San Diego State investigate the practicality of using the Open University materials in U.S. schools.

National College, Inc.

Sponsored by Rollins College of Winter Park, Florida, the

National College initiated registration in Fall 1971. Offering courses nationwide, it is designed to "recognize learning whenever, wherever and however acquired".

Campus Free College

Started in Fall 1971, CFC is a national network of Program Advisors who work intensively with students to create an individualized learning program that may employ any combination of formal or informal learning experiences. CFC does offer evaluation and a degree.

Other Proposals for National Colleges

A. International University for Independent Study. Proposed by the Academy for Educational Development, Inc.

B. National University. Proposed by a group of educators, including Hugh F. McKean, Grayson Kirk and Douglas M. Knight. They have a charter from State of Florida and are seeking support.

C. University of North America. Proposed by L.E. Dennis, Provost and Director of the Massachusetts State College System.

D. Future Resources and Development, Inc. An organization that only is developing course packages that may be used as a cost-saving device on traditional campuses, or by individual students in external degree programs.

APPENDIX C

OPEN SCHOOLS ABROAD (OTHER THAN U.K.)

I. Japanese Broadcasting Corp. (NHK)

The NHK now has a predominantly secondary-level educational program that was established in 1963. Lessons are mostly by correspondence, although there are weekly TV programs for each course. The mission of the organization is to upgrade the labor force and to offer high school education to those who did not attend. NHK is an independent institution operating under a government charter. Student enrollment is about 17,000, serviced by 100 teachers, 250 part-time readers, and 80 TV producers. Twenty-five different courses are offered in high school subjects, other specialized vocational courses are also available. The cost to students is about $25 per year.

NHK is now broadcasting pilot courses for Tokyo and Osaka Universities for home study and is looking to establish an open university in the near future.

II. Bavarian Telekolleg

Operated jointly by the State of Bavaria, and the Bayerische Rundfunk, the Telekolleg offers an alternate route to a trade or technical school diploma. Fourteen courses are offered. Each course has 78 lessons with one TV program per lesson. Correspondence

materials with some audio cassettes, make up the bulk of the instruction. Every third week the student must spend 5 hours at Kolleg classroom. Emphasis is on the secondary school level. Enrollment is about 8500 students per year. Cost to students is about $50 for entire course of study. Operating budget has been about $1,000,000 per year during start up, but long-term support needs are expected to be about $200,000 per year.

III. TV Technical School (Poland)

Operated jointly by the Ministry of Education and the Polish Radio and TV network, the school offers courses at the college level for working adults and students geographically remote from a college. Registration is about 12,000 a year. Seventeen colleges register students for both residence classes and correspondence work. Course study is four years,with the first two taken by correspondence. Three first and four second year courses have associated TV lessons, 2½ hours per week. Any person in Poland can take the end-of-year exams for the first year's study. If they pass, they can formally enter one of the technical colleges.

IV. Others

Active programs using TV and radio at the elementary level and secondary level have been established in Australia, (Australian School of the Air), in Israel (Instructional Television Center), and in Sweden (TRU). The Swedish system also provides a training program for medical students. Satellite programs are being planned

for India and Brazil and a computer based teacher training program is in operation in Spain.

A review of these programs leads to the conclusion that with the possible exeption of the Polish program and the proposed Japanese activity, there is nothing yet at the higher education level that is really similar to the British Open University effort.

APPENDIX D

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APPENDIX E

Prepared by J. G. Truxal

IN-SERVICE TEACHER EDUCATION

Modern communications technology holds the promise of enriching and augmenting the educational opportunities open to teachers in elementary and secondary schools. The ultimate goal of the program is--improvement in the educational system through enhancement of the capabilities of the teachers. Modern communications technology can make possible attractive and effective continuing education throughout the teacher's active career, permit women to return smoothly to the profession after extended leaves for child rearing, and act as a major stimulant to educational innovation by smoothing the transition for teachers into novel learning modes.

The Customers

The importance of continuing professional studies has been clearly recognized for years by the education profession. One result for elementrary and secondary teachers is the widespread practice of establishing salary increments for graduate academic credits. As a consequence of this financial incentive and the individual's desire for further education, teachers constitute a large fraction of the U.S. students involved in part-time graduate work.

In this field, continuing professional study most often is pursued by late-afternoon or evening graduate courses offered once

a week during the normal academic year by a university near the place of employment. Under the stimulation of the National Science Foundation, summer institutes (typically six or eight weeks) have also evolved, with the NSF program involving about 25,000 teachers each summer. Finally, full-time graduate study is also utilized in its regular pattern during the summer or sabbatical leaves.

If the national goal is to provide the opportunity for as many teachers as possible to reach the maximum feasible educational level, there are several major shortcomings in the system as it exists today:

(1) The quality of much of the part-time graduate work is open to serious question because of

(a) The inherent limitations of evening and part-time study.

(b) The dominance of geographical proximity in the "students" selection of the school, with the result that weak but isolated schools are encouraged to offer large programs.

(c) The low priority associated with such a program when offered by even an excellent university.

(2) The variety of courses or programs available is frequently severely limited, and the teacher-student takes courses not of major interest or not related to his own teaching.

(3) In many cases, a single teacher from a department or school

takes a course or program, with the result that there is no one with whom he can discuss the material or implement educational change in his own working environment. (This limitation was one motivation for the NSF Cooperative College-School Science program, which attempts to involve a group of teachers from one school or district).

Of these criticisms, certainly the most common and strongest concerns the quality of existing programs. In the recent study for the Regents of graduate education in New York State, the offerings of the state colleges received exceedingly strong criticism. These are the schools which traditionally have emphasized teacher education.

The Market

There are just over 31,000 secondary schools in the United States, and 992,000 teachers for 14,600,000 students (51.5 million in both elementary and secondary schools). There are teachers now taking in-service, credit courses offered by regular universities, plus an untold number taking special courses and in-service training offered on a local, regional, or state basis. Undoubtedly, a significant number of teachers are prevented from taking courses by geographical isolation or personal responsibilities during out-of-school hours.

The Format for a Program

The undergraduate-level courses developed by the Open

University of the United Kingdom indicate the structure of a possible self-study program. In the basic courses there, weekly television broadcasts are used for motivational purposes and for discussion of particularly difficult or novel concepts. During the summer students are asked to spend a short period of time at a regional center, particularly for laboratory work and peer group interaction.

The development of an in-service program for practicing teachers is, in several respects, a simpler task than faced by an open university. First, in most school districts a particular course could be offered only if a small group (three or four) were actively interested. This would permit weekly meetings (scheduled entirely at the convenience of the group) for discussion (for example, with one participant responsible as group leader each week). Such meetings would also permit group activities, joint viewing of television tapes or movies, and laboratory or small-project work.

Second, schools already have a large variety of educational technology (projectors, tape players, as well as laboratory equipment). As a result, the bit to be distributed with the course could be restricted to special items and audio-visual materials, in addition to texts, workbook, and printed items. In the formation of science and technology courses of the Open University, for example, a major problem has been the experimental equipment development,

such as the $50 oscilloscope and signal generator electronic combination.

Curricular Content

Any discussion of curricular content is necessarily nebulous unless it focusses on specific courses. If one asks how the content differs from the conventional graduate course as a consequence of the utilization of educational technology, the question really is: how can the television medium (for example) be used effectively in graduate education programs? The answer clearly is constrained only by the creativeness of the responder and the cost limitations.

For instance, a course for social science teachers might include a sizeable section on the comparative treatments of the same events in different countries. Partial translations of junior high school texts in such countries as the USSR, France, Germany, and the UK would indicate the treatments of World War I or the Industrial Revolution in these nations compared to the U.S. Television tapes then would portray samples of the corresponding classroom discussions and student and teacher attitudes. Audio cassettes then would be prepared with discussions of the materials and their significance by scholars in the field.

In quite a different direction, a course in the fundamental concepts of probability should be appealing to teachers of social science, mathematics, and science. In this case, the course could

be developed around a sequence of problems--games and familiar situations. Simple multi-stage division problems can motivate the initial portion through consideration of a series of inter-dependent decisions, with success at each step determined probabilistically. With rather simple ideas of probability as a basis, the "student" can rapidly advance to an increased understanding of such games as contract bridge and such familiar phenomena as the formation of queues or waiting lines. Educational games can be used, such as Planafam developed by Professor Thomas of Harvard University, in which the player selects his strategy for family planning and then rolls dice to simulate the passage of the years. The primary goal of the probability course is to give the teacher-student a basic level of literacy in probabilistic ideas as a step toward appreciation of the wide variety of societal and scientific phenomena which can only be experienced in terms of stochastic processes. In this case, the course utilization of educational technology should include use of the digital computer if available in the school (primarily in order to move the simulations as far as possible toward the real-world situations).

Proposed Program

A final advantage of experimentation with in-service teacher education is that a small number of courses can be developed on an experimental basis. Many of the teachers now taking part-time graduate work do not have specific degree objections, so that an

entire master's program is not required before realistic trial and evaluation can be undertaken. Furthermore, while universities would presumably grant credit for such self-study work, in many states the critical question is the recognition of the courses by the State Education Department.

APPENDIX F

Prepared by J. G. Truxal

A SELF-STUDY PROFESSIONAL MASTER'S DEGREE IN ENGINEERING

This proposal is for the development of the educational packages needed to offer eight graduate-level courses in electronic systems engineering. These courses are to be offered by existing universities for practicing engineers to complete in a self-study mode. Each course package will consist of self-evaluation materials from which the student can determine his own lesson plan, and detailed lessons made up of text, problems, audio and audio-visual materials, and kits for experimental and project work. The work completed by the student will be submitted to the sponsoring university in the usual correspondence course mode. Each university will decide how to administer the final examination for certification.

The plan differs from the traditional correspondence course primarily in the flexible use of modern educational technology. The extent to which television discs or tapes are used will depend on both the particular course and the available equipment. Each administering university will be able to adapt the educational packages to its local situation, for example, to complement a regional ITV system or a tape-distribution network or part-time study.

Background

The increasingly popular, external degree program is based on the concept of degree credit for learning without regard for the location of that learning--we are recognizing that the university campus is only one possible locale for education. This trend parallels the rapid development of educational technology, ranging from the high technology of computers and cable or satellite television to the commonplace, low technology of audio cassettes and audio filmstrip equipment. Together these innovations promise radical changes in the form of post-secondary education. In the United States, the Chicago TV College and New York's Empire State College are among a wide variety of major experiments, paralleling The Open University of the United Kingdom and related programs in Munich, Scandinavia, and Japan.

These existing experiments strongly focus on undergraduate education and often work with a set of customers within which the depth of motivation varies widely. From an educational standpoint, there are significant reasons to experiment concurrently with a graduate, mater's program aimed at a large market of professional--for example, practicing engineers or school teachers. Such a program would have the following advantages (if we use electronic engineering as a specific illustration):

(1) Reasonable diversity of educational background of the participants. With the engineering baccalaureates

distributed over a large number of colleges and many years in time and with the widely varying work experiences, the students would represent major remediation problems, but at the same time they all would have had familiarity with differential equations and circuit analysis. In contrast, in the undergraduate programs we are likely to work with students whose mathematical background and reading capabilities vary over a fantastic range.

(2) Reasonable uniformity of student motivation. The professional (whether engineer, teacher, physician, or lawyer) is aware of the importance of continuing professional study to up-date his abilities. In addition, in the case of the engineer, the organization for which he works can exert pressure on him to continue his education throughout his career.

(3) The engineer (and teacher) has the advantage that he can take a self-study course or educational program with a small group of his peers (often friends from the same organization). The experiences of The Open University and other experiments have demonstrated the central importance of the opportunity for frequent discussion of new material with other students and occasionally with mentors or individuals already familiar with the subject matter. The self-study materials can then be developed

to include regular meetings of small groups of students to discuss the work and exchange personal experiences and difficulties.

(4) A normal master's program in engineering, even at the best universities, tends strongly to involve a much greater lecture content than the typical undergraduate program, where classroom and informal discussion is the central characteristic. Thus, the conventional master's course is more readily transferred to a presentation via educational technology, especially since the material tends to be highly quantitative. The success of the Florida, SMU, Stanford, and CSU television presentations of graduate engineering work attests to this characteristic. Thus, by working with an engineering master's program, we are in a sense taking the easiest route for this early experimental development.

Structure of the Program

If we decide, as suggested in the later section on potential customers, to develop a master's program in electronic systems engineering, there is a minimum of eight, three-credit courses required (with others to be added subsequently to provide elective options). While the curricular details will be the goal of initial planning, we can postulate the following, possible offerings:

1. Linear system analysis 2. Probability and statistics 3. Stochastic systems 4. Solid state physics	Science foundation
5. Active devices and integrated circuits 6. Communication techniques 7. Special-purpose computers 8. Digital filters and systems	Engineering applications

Clearly, each of these courses should stand alone insofar as possible, so that the individual engineer can take one or more courses without a commitment to the entire degree program. Also, as additional programs are developed, many of these courses will be useable for other degree specializations. From an educational standpoint, the important goal is to provide a continually up-dated set of courses through which the practicing engineer can continue his education throughout his career; the packaging of the courses in a master's degree program is primarily a way to heighten student motivation and provide traditional credentials for the individual and his employer.

If we accept this primary goal of establishing a pattern for lifelong learning, the most important target is the relatively young engineer-no more than 5 to 10 years away from his baccalaureate (or at least no farther from active educational experiences).

A Specific Course

Each of the eight courses listed above is offered in the normal graduate program at most universities with engineering schools. Consequently, in each case textbooks are already available, and

behavioral and attitudinal objectives to measure student achievement can be established with a reasonable effort.

As an example, the probability and statistics course would be based on selected portions of such texts as Drake, Davenport, and Papoulis. The text material, however, needs to be supplemented by a large amount of background material, for example on the fundamental concepts of probability. Kits should be provided for a variety of games illustrating the basic ideas, including the range from simple gambling situations to Monte Carlo modelling of such probabilistic situations as queueing. The central focus of the probability section would be built on a study of multi-stage decision processes, as exemplified by the Drake text. The goal of the two courses (Probability-Statistics and Stochastic Systems) should be coverage of the Davenport and Papoulis texts, but with emphasis on the viewpoints of the student and the problem-solving capabilities in the electronics area.

This particular portion of the program illustrates the wide range of educational technology which can be developed. The basic ideas of probability can often be developed in terms of gaming situations presented through workbooks in an interactive mode. The significance of the various distributions of importance in engineering can be presented in audio and/or video cassettes in the lecture mode, preferably with the interactive possibilities inherent in the Polaroid experiments (where a wide variety of

questions asked by classroom students are also taped and indexed with the professor's responses). Finally, in game-theory models there are profound philosophical questions which have to be discussed in small group meetings; indeed, without such discussion, the probability course tends to become an array of mechanistic, problem-solving techniques.

The course also illustrates the problem of disparate student backgrounds. For students who have worked in the reliability area or have had a course on reliability engineering, large segments of the probability-statistics course would be unnecessary; hence, each section of the course must have clearly defined behavioral and attitudinal objectives to allow the student to proceed at his own pace or to omit portions. Each section should start with a self-examination to depict to the student his capabilities and background needs particularly since existing undergraduate curricula in engineering vary so widely in emphasis on probabilistic concepts.

The course also emphasizes the potential role of computers. While the program certainly should not depend on the availability of computing capability, the majority of the students will have access to computers which can be used for simulations, synthetic laboratory work, and problem solving. The courses will be designed to take the fullest possible advantage of this opportunity for enrichment.

Finally, the probability-statistics course does not illustrate

well the importance of experimental, self-study kits. With the continually decreasing cost of electronic components, the basic courses in electronic circuits and devices can involve experimental work--either in the laboratory of the organization where the engineer works or through kits loaned to the student. The experience of The Open University with loaned kits (involving a $50 oscilloscope and signal generator) indicates the feasibility of such a distribution system for self-study courses. Electronic systems is the ideal field in which to utilize such experimental packages.

Implementation of the Program

The development of the package of 8 courses is a major undertaking even though texts are currently available and graduate schools, industrial organizations, and professional societies have offered much of the material in a wide variety of educational formats to practicing engineers. Certain factors seem to dictate the organization appropriate for the development of the program:

(1) The courses should be offered under the aegis of universities which would give regular graduate credit for the work completed. This will ensure the transportability of the work and its recognition by industrial organizations.

(2) Once developed, the educational materials package should be available to all universities (not just one or two in the state) in order that the program does not alter

significantly the existing balance among the various institutions. Furthermore, the materials should be useful as complimentary to the on-campus graduate programs, and be particularly attractive as an alternative to part-time, evening graduate work.

(3) The actual work of generating the required educational packages is beyond the capabilities of any one institution. The ideal arrangement would involve heavily appropriate individuals from industrial research and development groups, particularly because there is a familiarity with modern engineering practice which is rarely found in universities.

(4) The State Education Department should be involved in the management of the program because of its responsibilities for external degree programs and for the licensing of engineers.

In the light of these comments, we visualize a program in which the State University of New York at Stony Brook would join with the State Education Department in a proposal to the federal government for development of the educational materials for the eight courses, with the development phased over the next three years. The program would involve the following steps:

(1) Planning of the detailed curriculum through joint efforts of personnel from the universities, industrial organizations,

Education Department, and professional societies.

(2) Establishing small teams of experts in subject matter and in educational technology to work in each of the areas.

(3) Continuing evaluation and modification of the materials through trial both in university programs and among practicing engineers.

(4) Once each course is developed, it will be made available at cost to institutions which wish to use it either with resident or correspondence students. Naturally, individual institutions will want to modify the courses to adapt them to their programs and to impart the distinctive flavors which constitute the strength of diversity in engineering education in this country.

The cost of the program is difficult to anticipate at this point. A program which includes extensive educational technology can consume almost boundless resources. For instance, if we demand television tapes of broadcast commercial quality, a full set of 45 fifty-minute lectures for one course can cost $9,000,000 (at the usual $4,000 per minute). At the other extreme, a student cameraman taping a teacher offering his usual course can generate a complete set of tapes for about $6,000.

Obviously, television (or film) will be used sparingly--only for the presentation of particularly difficult concepts. Since the cost is so dependent on the technological mix, and since the

audience is highly motivated, it seems reasonable to set the total cost at the outset and then try to optimize within this constraint. If the program capitalizes fully on the unused capabilities of the instructional resources centers at the participating universities to control the cost of audio and video production, it should be possible to develop the courses at a cost of $100,000 each. While this figure is an order of magnitude lower than the cost of a typical course developed under NSF curriculum efforts in the past, it should be feasible because of the existence already of quasi-suitable text materials and the experiences of both industry and universities with the proposed course materials.

Potential Number of Customers

The attached summary of the survey made by the New York State Education Department suggests a conservative estimate of the interest in such a program. We should note that this survey was specifically directed at determining the interest in a full master's program; as emphasized earlier, the primary goal is continuing education of the practicing engineer. Hence, success ultimately should be measured by the number of students taking each course rather than the number of master's degrees granted. Furthermore, there will be an ancillery benefit in the reduction of the cost of normal graduate work in the universities. (See Appendix G).

APPENDIX G

CUSTOMER POTENTIAL FOR CONTINUING-EDUCATION, SELF STUDY MASTER'S PROGRAM IN ENGINEERING

The New York State Education Department has just completed a survey of practicing engineers in New York State to determine their attitudes toward a continuing-education, self-study master's program (in the open-university format). This seems like one of the few attempts to make an evaluation of customer potential in this area, and the results are both interesting and encouraging.

Characteristics of Survey

(1) 4,000 questionnaires were mailed, with no follow-up; 1,298 (32%) were completed, (plus another 32 from individuals without baccalaureate so that they had no interest in a master's program). Presumably there are close to 100,000 engineers in the State.

(2) Seven professional-society directories were used, so the survey studied only the half of all engineers who belonged to societies (probably the more education-conscious half; the recent Hofstra program to retrain unemployed engineers had 25 enrolees, none of whom was a member of a professional society).

(3) Of the respondents, 38% were electrical, and essentially an equal number mechanical; 24% were in no engineering discipline

(usually were in management)--of a total of 155% since the respondents could list more than one discipline.

(4) 48 companies each employing more than 50 engineers were also surveyed; 23 companies responded.

Results of survey

(1) 74% expressed the need for the program, 7% no; 19% uncertain.

(2) 32% said they would take the program; 26% no; 42% uncertain. Of these, almost 1/3 stated they would be looking for improvement of current job skills; 22% wanted management and supervisory skills; only 14% wanted to broaden their education.

(3) Of the company responses, 74% said there is a need and 22% were uncertain. 78% said they would accept and recognize the degree (4% no) and 83% would encourage employers to participate (17% uncertain). The companies, incidentally, had zero interest in management and supervisory training.

Comments

It is difficult to know how much weight to associate with the responses of interest by the engineers; how many would actually enroll and, of these, how many would complete a reasonable amount of work?

In terms of interest expressed, 32% said they would take the program and 42% were uncertain. Even if we leave out entirely the uncertain group, 10% of all the individuals to whom the

questionnaire was sent indicated they would take the course. Nationally, this would mean 50,000 in this category. Even if only 20% enrolled and completed a significant block of work, the program would affect 10,000 individuals.

The impact of major interest would be, however, on the young engineer not too many years out of school. To what extent would the existence of the program encourage him to develop the practice of life-long learning? The strongest interest was naturally shown by the respondents under 45 years of age (indeed among these the most favorable group was less than 25).

Several conclusions seem to emerge:

(1) The engineers represent a significant and generally respective set of potential customers for such a program.

(2) If the material is to be of sufficiently outstanding quality to provide the necessary continuing motivation to keep enrollees in the program, preparation will be costly (and mere tapings of existing courses are inappropriate even with the addition of remediation material).

(3) Once specific areas of study are selected, the national aggregation of the market seems essential. If 10% of the enrollees take a particular "course", the number nationally may be as low as 1,000; in New York alone, it would then be 100--clearly not large enough to justify the "course" development required.

APPENDIX H

July 5, 1972

Mr. Ralph Volpe
Vice Chancellor's Office
University Extension
Madison, Wisconsin 53706

Dear Ralph:

Answers to the questions you raised the other day are suggested below:

1. The number of people in Wisconsin, eighteen years or over, who are not in college and could be?

Using the 1970 census for Wisconsin, one find this information:

a. The educational achievement of persons 25 years of age and older:

Less than 4 years of high school.	1,033,762
Four years of high school.	796,799
College, 1-3 years.	226,591
College, 4 years.	132,752
College, 5 or more years.	90,855

Depending upon how one interprets "1-3 years of college", the census figures indicate that in 1970 there were

i) 346,601 persons in Wisconsin, aged 25 and over, who were "not in college and could be". (This figure obtained by starting with the number of persons who had four years of high school -- indicating qualification -- and subtracting from this group those who had 1-3 years of college, 4 or 5 years or more, on assumption that any years of college completed takes a person out of the "not in college" category.

ii) OR, there were 573,192 "not in college and could be". (Since the "1-3 years of college group" is likely to indicate an uncompleted college career status, we subtract

from our "4 years of high school" group only the 4 years and 5 or more years of college, leaving the 1-3 years in the group "not in college and could be".

Note: It seems that neither i) or ii) above is likely to provide a reliable answer to question one. While the census statistics are generally our most reliable source of demographic information, the 1970 census is now two years old. Furthermore, the way the statistics are reported requires us to "interpret", as in the case of 1-3 years of college group. If one assumes that the 1-3 years of college group includes persons 25 and over who are in college as well as persons who have dropped out; and if one assumes that these two groups will (for various reasons) roughly equal each other; then one comes up with the figure of 113,295 persons who may be added to the i) figure or subtracted from the ii) figure -- yielding the figure 459,896, probably somewhat more reliable than i) or ii) but impossible to check in the statistic available.

In the circumstances, one would be justified to conclude that conservatively, there are now 400-450,000 persons, 25 years of age or over in the state who are not in college and could be. If "open" admissions are to be made available, then of course the number who could be in college would increase substantially.

b. Turning to the 18-24 year age group (the group likely to include most of the present college population) we find that in 1970 there were 497,657 persons in this category. Of this group 74.2% (369,261) were high school graduates, presumably qualified for college. Now, the number of persons, (all ages) reported in college in Wisconsin in 1970 was 165,002. Subtracting this figure from 369,261, yields a gross figure of 204,259, the number of 18-24 year olds who could be in college but were not. (The actual number is probably larger, since we subtracted an all age group from the 18-24 group; but the figure has the advantage of being conservative). However, some of these persons undoubtedly chose post secondary school programs other than college. In 1969, CCHE estimated that 18.4% of high school graduates (66,800) joined vocational-technical programs.

The 1970 census breakdown for the 18-24 year age group indicates that

of 18-19 year olds, 61.6% or 101,822 were in "regular schooling"

of 20-21 year olds, 36.3% or 51,008 were in "regular schooling"

of 22-24 year olds, 15.9% or 30,587 were in "regular schooling"

"Regular schooling" would seem to include all formal traditional programs open to persons in these age groupings; hence the figures in each age category would presumably include persons who were not qualified for college as well as persons who were, and would include persons in vocational-technical programs.

(Note: The "regular schooling" category does not include specialized vocational, trade or business schools, on-the-job training, or correspondence courses. Hence, the census data relating to Educational Achievement are seriously deficient with respect to adult and continuing education demography).

If we eliminate the 25% in the 183,417 (sum of persons in "regular schooling" above) who were presumably not qualified for college, we have 137,563 persons; and if we subtract from that group the 18.4% of high school graduates who chose vocational-technical tranining, (66,800) we come up with 70,763 persons in the 18-24 age group in 1970 who were qualified but did not go to college.

To check that figure, we now subtract the number of persons in "regular schooling" from the gross number of 18-24 year olds who could be in college but weren't (204,259,137,563). We now have identified about 67,000 persons who presumably were qualified, did not choose vocational-technical training, and did not go to college. This compares reasonably well with the 70,000 identified in the paragraph preceeding.

c. We can now provide a conservative estimate that, as of 1970, there were 470,000-520,000 persons 18 years or older who were qualified for college but not attending college

or vocational-technical schools. However, even as a conservative figure, the 470-520,000 population could justifiably be used as a target population only with further refinement.

Note: Again, the effect of open admissions would alter this figure substantially; or the availability of new degree options would have a similar effect.

2. Of the population identified above, how many want to go to college?

To arrive at a realistic answer for Extension, the question, "want to go to college?" should be modified to express the concept of obtaining a college degree through Extension -- an external degree, or open school degree. Respondents asked if they want to go to college, think of all the reaons they can't go, and indicate negatively if they are firmly tied to home, family, community, job responsibilities, or are institutionalized.

In the Open School survey, conducted by Extension's Survey Research Laboratory, a number of statistics emerged which throw light on the question. The Open School survey sought telephone interview responses from a scientific probabilities sampling of Wisconsin householders. In 1970 there were 1,328,804 householders in Wisconsin (a 15.9% increase over the 1960 census, which was the basis of the Open School Survey). The householders' responses were treated as individual responses, although the average household is compared of 3 to 4 persons. The statistics thus yielded by the Open School Survey underestimate the total potential responses of a total population survey. Nevertheless, the householder survey yielded results remarkably similar to calculations drawn from the population as a whole, and thus exhibit a satisfactory credibility.

The Open School Survey indicated that 48.2% of respondents interested in taking Open School courses would enroll for credit towards a degree or diploma. This converts to 211,359 persons. This figure may be further refined by noting the responses that specifically identified only college credits (31.8%) or 139,444 persons (based on 1966 census). To obtain

a figure for a similar population in 1970 we must not approximately 16% increase in households since 1960, an increase which gives us the figure of 161,775 householders who want college credit, assuming there has been no change in the aspirations of this group since the survey was made. That this figure is low seems demonstrable in view of the fact that we have not extrapolated to the adult population (18 and over) as a whole. However, the figure is roughly 30% of the total population identified in question 1, and seems to provide a conservative estimate of the potential responding clientele for a college degree program.

Note: There are a number of other refinements that could be made, but the figure 161,775 seems reasonably defensible on a conservative basis. Before programming for this clientele, however, a further survey is needed when the specific nature of the proposed degree offering is known, and when the telephone survey responses can be corrected for the bias introduced by using the telephone.

3. What are the barriers to the population, identified in question 2, going on to college? Again, we must be careful of the "going on to college" phrase.

There is a wealth of information of various kinds on the reasons given by adults for not continuing education. Much of the information is informal and subjective. Letters from students in the Independent Study department are in many cases pretty eleoquent testimony to barriers; the literature of Extension/adult education, the literature of educational criticism and renewal; the counseling records of the AIM program; and the records of the Governor's Commission on Education on its public hearings and discussion are all sources of information barriers. Barriers varying according to individuals and situations, of course, but the list following probably indicates those barriers that are most frequently cited or implied:

a. Person is not free to move to a campus to pursue a degree full time. (Has a wife, family, job; a husband, children; takes care of older people who depend upon him/her; etc.). Hence, part-time learning, living, earning is a necessity. Part-time learning programs for such persons in the past

were really nearly deadend routes, because degrees could not be obtained, and credit transference was (and still is) hazardous.

b. Person cannot afford cost of continuing education full time, even if he could manage a move. For the adult, the cost of education is higher than for a youth. The cost may include the expenses of the family, other dependents, of travel between home and school, etc. Financial aid in amounts needed has not be available. Adult learner who sacrifices a job and income, even in part, must include that sum as part of the cost of education. Even part-time learning is costly, especially for the socio-economic populations we have been trying to reach.

c. Person who has been away from school may lack confidence to resume formal learning, especially in programs primarily designed for youth. He needs couseling of a different kind than that provided to youth; yet by and large, there has been no agency that he could turn to for the broad kind of adult conseling needed.

d. Person has no option but to continue, if at all, in academic programs designed primarily for youth. The special adult needs, problems and interests, and his special motivations, maturities, skills and experiences seem ignored by the schools that have largely catered to youth.

e. Person has matured enough, been responsible long enough, to have goals that the school, in its primary concern for youth, has not yet recognized as academically legitimate. College curricula are generally designed down, to focus on the immature beginner. The adult learner may have needs for learnings similar to youths, learnings that were missed along the way, but he has not necessarily been static and passive even though out of school. He is likely to be much more perceptive about goals/objectives, and less willing and capable of yielding up to the school those responsibilities and activities which life has taught him he must bear. He is not likely to relish re-establishing a dependency role with the school.

f. Person needs more channels of communication and learning than school sanctions; his adult life style yields a different

learning style; he finds it difficult, contraining, to be forced into a largely print/writing/lecture/discussion program that is characteristic of the residence instruction aimed at youth. His life style makes freedom in timing, pacing, important; and his maturity enables him to discipline himself better than youth.

g. Persons' self-image is seriously threatended upon undertaking formal learning programs as adult. This is particularly true when programs are primarily youth and/or subject centered. Learning implies making mistakes, changing. This process may be threatening if the adult is required to expose his weakness before his peers (and even more so if he must do so before youth) before he has found the necessary confidence and made a successful beginning regarding a new self-image.

I'd be glad to share any data I have, such as the computer print-out for the Open School Survey. Or you may want copies of papers, or bibliographies in this area. The published AIM report and the Open School report are of course available to you; but you are welcome to other sources as well.

With best wishes,

Sincerely yours,

Charles A. Wedemeyer

CAW/ss

APPENDIX I

A COST-EFFECTIVE PRODUCTION PROGRAM

Many teachers have approaches to teaching their subjects which would enrich or provide basic insight to any presentation. However, few content specialists are comfortable with, or even familiar with, media production; hence, their possible contributions are overlooked because of obstacles to translation. This situation could be changed if a program were designed to expedite the translation process.

Such a program would consist of three parts. The first part of the effort would be an extensive audio-recording activity. After selecting subject-content areas in which courses are to be developed, teachers of the subject would be approached, and if cooperative, a substantial number of their classroom presentations would be recorded on audio tape. All visual materials used in the sessions would be copied into notebooks and identified with the associated audio recording. A team of curriculum-development specialists would review these recordings and select portions that could be used as segments of one or more versions of a final course. Media specialists would work with these parts and convert them to a slide/audio tape sequence, noting any portion of the segment that would benefit from moving-image visuals. This conversion is not particularly expensive and allows extensive editing with

little complication.

A second phase of the program would be to encourage teachers, curriculum-developers, students, or other interested parties to submit slide/audio tape sequences they may have prepared for their own use. The number of submittals may be small initially, but many teachers are learning how to use a camera and tape recorder with expertise and, with the growing emphasis on individualized instruction, the need for these skills will also grow. An annual contest would be sponsored through various professional societies with sufficiently substantial prizes to encourage many entries and society membership could assist in the judging process. The output of this section of the program would also be a series of lessons or mini-courses in the slide/audio tape format which would have been reviewed by a number of judges and deemed to have merit as learning aids.

The third phase of the program would be the further choice of materials from the first two sections for conversion to video cassettes. Professional video specialists would convert the tape-slide format into full video treatment, using the stills when considered desirable, but also introducing any motion sequences which would improve the presentation. This activity, the most costly in the program, would benefit from a comprehensive review of materials prior to the video treatment. Tapes would be developed at existing production facilities on a contract basis. No standard length would be imposed.